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OAKLAND HARBOR, CALIF.

LETTER

FROM

THE SECRETARY OF WAR

TRANSMITTING

A REPORT FROM THE CHIEF OF ENGINEERS ON PRELIMINARY EXAMINATION AND SURVEY OF OAKLAND HARBOR, CALIF.

MAY 29, 1926.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration

WAR DEPARTMENT,
Washington, May 29, 1926.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEAR MR. SPEAKER: I am transmitting herewith a report, dated the 28th instant, from the Chief of Engineers, United States Army, on preliminary examination and survey of Oakland Harbor, Calif., authorized by the river and harbor act approved March 3, 1925, together with accompanying papers and map.

Sincerely yours,

DWIGHT F. DAVIS,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, May 28, 1926.

Subject: Preliminary examination and survey of Oakland Harbor, Calif.

To: The Secretary of War.

1. I submit, for transmission to Congress, my report on preliminary examination and survey of Oakland Harbor, Calif., authorized by the river and harbor act of March 3, 1925, together with accompanying papers and map.

2. Oakland Harbor is located on the eastern shore of San Francisco Bay. The inner harbor consists of the waterways between the cities of Oakland and Alameda, and extends from San Francisco Bay to San Leandro Bay. The outer harbor extends in a northeasterly direction for about 2 miles from the entrance to the inner harbor. There is an existing project which provides for a channel 30 feet deep and 800 feet wide through the shoal southeast of Goat Island, narrowing to 600 feet at the ends of the Oakland jetties; thence 600 feet wide to Webster Street, with additional widening to the pierhead line in front of the municipal wharf; thence 500 feet wide to Brooklyn Basin and through the south channel to Park Street, with a turning basin at the east end 500 feet wide and 1,200 feet long; for a channel 18 feet deep and 300 feet wide from Park Street to San Leandro Bay; for a channel 25 feet deep and 300 feet wide in the north channel of Brooklyn Basin; for the maintenance to project depth of the area along the south side of the channel from Harrison Street to Brooklyn Basin; and for parallel jetties at the entrance; subject to certain conditions of local cooperation. The range of tide between mean lower low water and mean higher high water is 6.3 feet.

3. Local interests have requested extensive additional improvements, which include a channel 35 feet deep in the bay, a channel 33 feet deep from the end of the jetties to the west end of Government Island, a turning basin of the same depth, maintenance of an enlarged area in the inner harbor, widening the existing south channel in Brooklyn Basin to 1,000 feet, deepening the tidal canal to 25 feet, increasing by 200 feet the width of right of way for the tidal canal, reconstruction of bridges over the tidal canal, a channel up East Creek Slough, a channel along the Alameda shore of San Leandro Bay, a turning basin in San Leandro Bay, and a channel 35 feet deep and 800 feet wide to the Key Route Basin.

4. The district engineer states that the commerce of Oakland Harbor in 1925 was 2,767,000 tons, the principal items being food products, oil, and lumber. He also calls attention to the material increase in the number of deep-draft carriers which appear to have been occasioned by the larger tonnage of foreign and coastwise traffic. It has been customary, in the interest of economy, to allow the interior channels to shoal to 25 or 26 feet before redredging. While this has not been particularly objectionable in the past, the deeper draft vessels now visiting the port are somewhat handicapped. The district engineer believes that a channel 33 feet deep should be provided from deep water in the bay to Harbor Line Point No. 58, in Brooklyn Basin. He proposes to widen the channel to 600 feet between Webster Street and the western end of Government Island, and to provide a turning basin at the western end of Brooklyn Basin. He would also maintain, to the 33-foot depth, an additional area south of the channel between Harrison Street and Harbor Line Point No. 58.

5. The existing depth in the tidal canal above Park Street is 18 feet at mean lower low water. Lumber carriers, however, have difficulty in navigating it, and some cargoes are necessarily lightered. The district engineer considers the present and prospective tonnage ample justification for increasing the depth to 25 feet, which he recommends. He does not believe necessary any increased width of right of way. His recommendation is contingent upon the assump-

tion by local interests of the cost of alteration, and continued operation and maintenance, of the three drawbridges over the tidal canal.

6. The city of Oaklnad has dredged and maintains a channel 30 feet deep and 250 feet wide from the bay to the Key Route Basin. This channel has several bad bends, two of which are of about 90° each. The district engineer states that a direct channel would shorten the distance from the bay to the basin by about 3,000 feet, and would eliminate the worst bends. He believes that a channel 500 feet wide and 30 feet deep would be adequate for the present and immediately expected traffic. He recommends the provision of such a channel, but on account of the extensive local benefits considers that 50 per cent cash cooperation should be required.

7. The other items of work requested by local interests are considered by the district engineer to be unnecessary at present. The total estimated cost of the work which he recommends is $1,514,000, with $100,000 annually for maintenance. His recommendations are contingent upon the following requirements of cooperation, in addition to those provided by the existing project and to those specifically mentioned above:

(*a*) The provision of suitable dumping grounds, together with all necessary levees, bulkheads, drainage canals, sluiceways, or other structures pertaining thereto.

(*b*) The provision of a wharf in the inner harbor of sufficient size to accommodate two deep-draft ocean-going steamers.

(*c*) The provision of a wharf in the Key Route Basin of sufficient size to accommodate at least one deep-draft ocean-going steamer.

(*d*) A contribution of 10 cents per cubic yard for material dredged from the tidal canal, with the privilege to local interests of using such material for reclamation of near-by lands.

(*e*) The removal of all sewers emptying into the north channel in Brooklyn Basin, or in lieu of such removal a local contribution of one-half the cost of maintenance of this channel.

(*f*) The establishment of a unified port authority within five years of the date of adoption of the new project.

8. The division engineer concurs in these views and recommendations.

9. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. The board considers that the magnitude and growth of commerce justify further Federal assistance. It believes, however, that a depth greater than 30 feet is not necessary under the existing conditions. A dependable channel of that depth can be provided by maintenance dredging to greater overdepths. The channel lines recommended by the district engineer are believed to be desirable. The recommendations of the district engineer as to the tidal canal are concurred in, as is his recommendation for an approach channel to the Key Route Basin, except that the board considers a width of 400 feet adequate in the latter case. The board does not favor the proposal to make the formation of a port district, or the construction of new terminals, conditions precedent to the work now proposed. The other conditions proposed by the district engineer meet with the board's approval.

10. After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors. Oakland Harbor had a commerce approaching 3,000,000 tons in 1925, a material increase over previous years. This commerce is of a general character, and to a large degree pertains to foreign and coastwise trade involving the use of deep-draft vessels. A depth of 30 feet at mean lower low water in the main channel is considered ample for the present, in view of the range of tide prevailing; a dependable channel of that depth can be provided by carrying the maintenance dredging to greater depth. The widening of the channel above Webster Street and the additional dredging of areas near and west of Brooklyn Basin are desirable to facilitate vessel movement. The tidal canal handles a large lumber business, which is having great difficulty with the existing 18-foot depth; an increase to 25 feet will be a great benefit to this business. The area bordering on the Key Route Basin is becoming an important industrial section, and a center for a large part of the oil business of the port. The present channel, dredged by the locality, is inadequate. On the basis of 50 per cent cooperation proposed, the United States is amply justified in providing a new channel 30 feet deep; as the channel is short, a width of 400 feet will be sufficient at present. The cost of the new work proposed is $485,000, of which $150,000 would be contributed by the locality; in addition, dredging of the main channel to a sufficient overdepth to guarantee a 30-foot depth will involve an expenditure of $1,035,000, which is of the nature of deferred maintenance.

11. I therefore report that modification of the existing project for the improvement of Oakland Harbor, Calif., is deemed desirable to the extent of providing for widening the channel between Webster Street and the west end of Government Island to 600 feet; for maintaining to within 75 feet of the pierhead line the area south of the channel between Harrison Street and Harbor Line Point No. 58, in Brooklyn Basin; for dredging to a depth of 30 feet at mean lower low water a triangular area about 2,700 feet long, and having a maximum width of 300 feet, at the western end of Brooklyn Basin; for an approach channel to the Key Route Basin 30 feet deep and 400 feet wide, following substantially the lines proposed by the district engineer; and for deepening the tidal canal to 25 feet; at a total estimated cost for new work of $485,000, with $100,000 annually for maintenance; provided that local interests shall contribute 50 per cent, or $100,000, to the cost of the channel to the Key Route Basin; shall provide suitable disposal areas for material removed in connection with the project and its subsequent maintenance; together with all necessary levees, bulkheads, drainage canals, sluiceways or other structures required therefor; shall alter or replace the bridges over the tidal canal, when, in the opinion of the Secretary of War, such alteration or replacement is necessary in the interest of navigation, and thereafter operate and maintain them; shall contribute 10 cents per cubic yard for material dredged in the tidal canal, with the privilege of using such material for land reclamation; and provided further that future maintenance by the United States of the north channel in Brooklyn Basin shall be contingent upon the removal by local interests of all sewers emptying therein, or, in lieu of such removal upon the contribution of one-half of the cost of maintenance. The first cost to the United States will be $335,000 for new work, besides

$1,035,000 of deferred maintenance which will be part of the initial dredging. The sum of $700,000 should be made available the first year and the balance the following year.

H. TAYLOR,
Major General, Chief of Engineers.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

SYLLABUS

The Board of Engineers for Rivers and Harbors recommends modification of the existing project so as to provide for widening the channel between Webster Street and the west end of Government Island to 600 feet; for maintaining to within 75 feet of the pierhead line the area south of the channel between Harrison Street and Harbor Line Point No. 58 in Brooklyn Basin; for dredging to a depth of 30 feet at mean lower low water a triangular area about 2,700 feet long and having a maximum width of 300 feet at the western end of Brooklyn Basin; for an approach channel to the Key Route Basin 30 feet deep and 400 feet wide, following substantially the lines proposed by the district engineer; and for deepening the Tidal Canal to 25 feet, at a total estimated cost for new work of $485,000; subject to certain conditions of local cooperation; in addition, dredging of the main channel to a sufficient overdepth to insure a dependable 30-foot depth will involve an expenditure of $1,035,000, which is of the nature of deferred maintenance.

[Third indorsement]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., May 25, 1926.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the reports on preliminary examination and survey of Oakland Harbor, Calif., authorized by the river and harbor act approved March 3, 1925.

2. Oakland Harbor is located on the eastern shore of San Francisco Bay, opposite the city of San Francisco. The outer harbor extends along San Francisco Bay in a northeasterly direction for about 2 miles from the Western Pacific Mole. The inner harbor consists of the waterways between the cities of Oakland and Alameda and extends from San Francisco Bay, at a point south of the Western Pacific Mole, to San Leandro Bay. The existing project for improvement of the harbor provides for a channel 30 feet deep and 800 feet wide through the shoal southeast of Goat Island, narrowing to 600 feet at the ends of the Oakland jetties; thence 600 feet wide to Webster Street, with additional widening to the pierhead line in front of the municipal wharf; thence 500 feet wide to Brooklyn Basin and through the south channel to Park Street, with a turning basin at the east end 500 feet wide and 1,200 feet long; for a channel 18 feet deep and 300 feet wide from Park Street to San Leandro Bay; for a channel 25 feet deep and 300 feet wide in the north channel of Brooklyn Basin; for the maintenance to project depth of the area along the south side of the channel from Harrison Street to Brooklyn Basin, and for parallel jetties at the entrance; subject to certain conditions of local cooperation. The range of tide between mean lower low water and mean higher high water is 6.3 feet.

3. The following improvements have been requested by local interests:

Deepening to 35 feet at mean lower low water the channel across Goat Island Shoal and to the end of the jetties.

Enlargement of the channel from the end of the jetties to the westerly end of Government Island to 600 feet in width and 33 feet in depth.

An adequate turning basin 33 feet deep at the westerly end of Government Island.

The maintenance, to whatever project depth may be adopted for the adjacent channel, of the area south of the channel and to within 75 feet of the pierhead line, between Harrison Street and Harbor Line Point No. 58, which latter is located on the south side of Brooklyn Basin, approximately on the prolongation of Nautilus Street, Alameda.

Widening the existing south channel in Brooklyn Basin to 1,000 feet.

Deepening to 25 feet the existing channel in the tidal canal above the Park Street Bridge.

Increasing the width of right of way bordering the tidal canal by 200 feet, in order to facilitate future deepening to 30 feet over an adequate width.

Reconstruction of bridges over the tidal canal, with foundations of adequate depth, and with adequate clear openings.

A channel from the tidal canal up East Creek Slough.

A channel along the Alameda shore of San Leandro Bay, from the tidal canal to Bay Farm Island Bridge.

A turning basin, of tidal canal project depth, between pierhead lines at the San Leandro Bay end of the tidal canal.

A channel 35 feet deep and 800 feet wide to the Key Route Basin.

4. The commerce of Oakland Harbor in 1925 amounted to 2,767,000 tons, of which 320,000 tons were foreign imports and exports. The principal items entering into the domestic tonnage were food products, oil, and lumber. Previous to 1925 the largest commerce of the port was 2,344,000 tons, in 1919. The increased tonnage was principally in foreign and coastwise traffic which moves in the deeper draft carriers. In 1924 there were 52 vessels drawing 24 feet or more; in 1925 there were 350.

5. The district engineer reports that silting, in the form of soft mud, causes channel deterioration to the extent of 6 to 9 inches per annum. Conditions are most favorable for the use of hydraulic pipe-line dredges in the inner harbor and a hopper dredge in the bay. For economy of maintenance it has been customary to allow the inner channels to deteriorate to a depth of 25 or 26 feet before redredging. With the use of deeper draft vessels the maintenance of a greater depth is urgent. The district engineer therefore believes that a project depth of 33 feet should be provided from deep water in the bay to harbor line point No. 58 in Brooklyn Basin. He would also increase the channel widths between Webster Street and the west end of Government Island to 600 feet, with an additional widening 33 feet deep at the west end of Brooklyn Basin to provide a turning basin. The area south of the channel between Harrison Street and Brooklyn Basin, which is now maintained by the United States, should, he considers, be extended eastward to harbor line point No. 58. The estimated cost of this work is $1,109,000, with $98,000 annually for maintenance.

6. The existing commerce in the tidal canal above Park Street, which consists principally of lumber and building materials, amounts to about 200,000 tons annually. Lumber is received in coastwise

steamers which have a full-load draft of as much as 22 or 23 feet. As the controlling depth in the canal is but 18 feet, some of the lumber has to be unloaded in the main harbor and lightered to its destination in the canal. Aside from the wharves and industries along the canal, it serves as an entrance to San Leandro Bay, the lands bordering which have a high potential value as industrial sites. In the opinion of the district engineer, a deeper channel would result in an increase within two or three years of more than 100,000 tons of lumber annually, the saving in transportation costs on which would be about $35,000. He recommends a depth of 25 feet and a width of 275 feet, at an estimated cost of $285,000, with $1,000 annually for maintenance. Additional width of right of way is considered unnecessary. The recommendation of the district engineer is contingent upon the alteration and continued operation by local interests of the three drawbridges over the tidal canal.

7. In the Key Route Basin there was handled in 1925 a total of 241,000 tons of commerce. The existing approach channel, which is 30 feet deep and 250 feet wide, was dredged and is maintained by the city of Oakland. The channel is crosswise to the tidal currents, and is narrow and indirect. The district engineer states that a direct channel would shorten the distance from the bay to the basin by about 3,000 feet, and would eliminate several bad bends, two of which are of about 90° each. He believes such a channel, 500 feet wide and 30 feet deep, would be adequate for present and immediately prospective needs. He recommends 50 per cent cash cooperation, allowing for which the estimated cost to the United States of this part of the project is $120,000, with $7,000 annually for maintenance.

8. The undertaking of the other items of work locally requested is considered inadvisable by the district engineer. The total estimated cost of the modifications in the project recommended by him is $1,514,000, and the estimated cost of maintenance for the entire project is $100,000.

9. The recommendations of the district engineer are contingent upon the following requirements of local cooperation, in addition to those imposed by the existing project:

(*a*) The provision of suitable dumping grounds, together with all necessary levees, bulkheads, drainage canals, sluiceways or other structures pertaining thereto.

(*b*) Agreement to alter or replace any or all bridges over the tidal canal when necessary, and to assume their operation and maintenance.

(*c*) That increased dimensions in the inner harbor be contingent upon satisfactory assurances that the city will construct and complete, within one year from the date of completion of the improvement, a pier in the inner harbor of sufficient size to accommodate two deep-draft ocean-going steamers.

(*d*) That a contribution of 10 cents per cubic yard be made for material dredged from the tidal basin, with the privilege of using such material for reclamation of near-by land.

(*e*) That the dredging of the entrance channel into Key Route Basin be contingent upon a contribution of 50 per cent to the first cost, and a guaranty that the city will, within one year after the completion of the channel, construct a wharf in the Key Route Basin of sufficient size to accommodate at least one deep-draft ocean-going steamer.

(*f*) That continued maintenance by the United States of the north channel in Brooklyn Basin be contingent upon the removal of all sewers emptying therein, or in lieu of such removal, upon the contribution by local interests of one-half the cost of channel maintenance.

(*g*) That all maintenance work by the United States under the existing or enlarged project, after five years from the date of the adoption of the new project, be contingent upon the establishment of a unified port authority to embrace the inner and outer waterfronts of both Oakland and Alameda.

10. The division engineer concurs in the views and recommendations of the district engineer.

11. The city of Oakland is rapidly developing into a first-class port of general commerce. Its water-borne traffic in 1924 was 2,217,000 tons. In 1925 this had increased to 2,767,000 tons. The increase was principally in the foreign and coastwise traffic, each of which had about doubled, whereas the internal traffic, which does not utilize deep-draft carriers, had not greatly increased. The commerce is of a general character, including petroleum, wood, paper, food products, manufactures, and a large volume of general merchandise. A similarly striking increase took place between 1924 and 1925 in the size of vessels, as is shown by the following table:

Vessel draft	Number in 1924	Number in 1925
Over 30 feet	0	18
28 to 30 feet	4	56
26 to 28 feet	11	89
24 to 26 feet	37	187
Total	52	350
Grand total over 16 feet	2,924	3,217

It is thus seen that while the increase in vessel movement was 10 per cent, the proportional increase in deep-draft vessels was very much greater. The board feels that the magnitude and growth of the commerce, and the extensive plans of the cities of Oakland and Alameda for improving their water fronts, justify further Federal assistance.

12. From the board's study of the case it appears that the principal difficulty encountered by deep-draft vessels of the type frequenting Oakland Harbor is caused by the custom of deferring maintenance until the controlling depths are materially less than that called for by the existing project. Under the conditions existing at this harbor, a dependable depth of 30 feet is believed to be fully adequate. This can be attained by carrying the maintenance dredging to greater overdepths. The large volume of commerce which moves above Webster Street Bridge justifies an increase in width in that vicinity. The dredging and maintenance of other areas in the vicinity of Government Island to provide better facilities is also considered desirable. The Key Route Basin appears to be rapidly developing a large commerce, and the neighboring land area is the site of important industries. A more economical and efficient approach channel than has been furnished by local interests appears desirable. The recommendation of the district engineer as to the location of this channel is concurred in, as also are the features of local cooperation and channel

dimensions, except that the board considers a width of 400 feet adequate for present and immediately prospective needs. The tidal canal is being utilized extensively, and the statistics submitted show that additional depth is necessary for the great majority of sea-going carriers operating in this channel. An increase in depth from 18 to 25 feet is clearly justified.

13. The board does not favor the proposal to make the formation of a consolidated port district or authority a condition to the project. It is in accord with the district and division engineers that such a procedure would probably be to the interest of both communities. On the other hand, as stated by the district engineer, the formation of such a district could not be made a condition precedent to the work now proposed without seriously delaying that work. The only alternative would be to have the condition come into effect at some future time, say in five years, as the district engineer proposes. This would leave the United States in the position of having completed the additional work on a large and important harbor, whose commerce is already of national importance, and will no doubt have much increased within five years; and of having no means of enforcing concurrence with the condition in question, other than by a cessation of maintenance dredging, which might cause a great hardship to commercial interests. Moreover, while a consolidation of the two ports would undoubtedly make for greater efficiency, it can not be said that it is a prerequisite to the development of an important commerce affecting a large hinterland, since such a commerce is already in existence. This condition should therefore be eliminated. Extensive water-front developments are under way or proposed both in the inner harbor and in the Key Route Basin. It therefore appears unnecessary to include a requirement for terminal construction.

14. The new work proposed by the board is estimated to cost $485,000, of which local interests would be expected to contribute $100,000 for work on the Key Route Channel and 10 cents per cubic yard for material dredged in the tidal canal, amounting to approximately $53,000. The provision of a dependable 30-foot channel necessitates dredging initially to a greater depth than has been customary. This work, which may be considered deferred maintenance, is estimated to cost $1,035,000.

15. The board therefore recommends modification of the existing project so as to provide for widening the channel between Webster Street and the west end of Government Island to 600 feet; for maintaining to within 75 feet of the pierhead line the area south of the channel between Harrison Street and harbor line point No. 58, in Brooklyn Basin; for dredging to a depth of 30 feet at mean lower low water a triangular area about 2,700 feet long and having a maximum width of 300 feet at the western end of Brooklyn Basin; for an approach channel to the Key Route Basin 30 feet deep and 400 feet wide, following substantially the lines proposed by the district engineer; and for deepening the tidal canal to 25 feet; at a total estimated cost of $485,000, with $100,000 annually for maintenance; provided that local interests shall contribute 50 per cent, or $100,000, to the cost of the channel to the Key Route Basin; shall provide suitable disposal areas for material removed in connection with the project and its subsequent maintenance, together with all necessary levees, bulkheads, drainage canals, sluiceways or other

structures required therefor; shall alter or replace the bridges over the tidal canal when, in the opinion of the Secretary of War, such alteration or replacement is necessary in the interests of navigation, and thereafter operate and maintain them; shall contribute 10 cents per cubic yard for material dredged in the tidal canal, with the privilege of using such material for land reclamation; and provided further that future maintenance by the United States of the north channel in Brooklyn Basin shall be contingent upon the removal by local interests of all sewers emptying therein, or, in lieu of such removal, upon the contribution of one-half of the cost of maintenance. The cost to the United States will be $335,000 for new work, beside $1,035,000 for deferred maintenance which will be part of the initial dredging. The sum of $700,000 should be made available the first year and the balance the following year.

16. In compliance with law, the board reports that except as contemplated by the above recommendations, there are no questions of terminal facilities, water-power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

EDGAR JADWIN,
Brigadier General, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF OAKLAND HARBOR, CALIF.

SYLLABUS

The district engineer reports that the city of Oakland and other interests have made plans for extensive and needed improvements of the water front in Oakland Harbor, which, if carried out, will do much toward increasing the ocean-borne commerce in this harbor. He is of the opinion that, for the full utilization of these proposed improvements, and in order to provide for the probable increased needs of navigation, some increase in the size and possibly the extent of the channels of the existing project seems to be necessary and he therefore recommends a survey upon which to base a plan of improvement and estimate of cost.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, San Francisco, Calif., November 25, 1925.

Subject: Preliminary examination of Oakland Harbor, Calif.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).

1. The following report is submitted on a preliminary examination of Oakland Harbor, Calif., made in accordance with the river and harbor act of March 3, 1925.

I. DESCRIPTION

2. Oakland Harbor is located on the eastern shore of San Francisco Bay, opposite the city of San Francisco. It is divided naturally into the outer harbor, fronting on San Francisco Bay and extending from the Western Pacific Mole in a northeasterly direction for about 2 miles, and the inner harbor, consisting of the waterways between

the cities of Oakland and Alameda, and connected by means of the tidal canal with San Leandro Bay. There are inclosed herewith, inclosure 1, blue line prints, file 2–2–68, in three sheets, of the latest survey of Oakland Harbor.[1] The range between mean lower low water and mean higher high water is 6.3 feet and the extreme range is 12 feet.

3. Originally Oakland and Alameda were residence cities, suburban to San Francisco. In more recent years, however, the industrial and business growth of Oakland has been very rapid. The present estimated population of Oakland is 295,000, and that of Alameda 32,000. Oakland is the terminus of two transcontinental railroads, the Southern Pacific and Western Pacific, and of the Sacramento Short Line Railroad, an electric line connecting Oakland with the cities of the Sacramento Valley. (See also par. 56, Railroads.) The location of Oakland and Alameda on the continental side of San Francisco Bay, with a large adjacent area suitable for industrial development, is favorable for a continued healthy business and industrial growth. The larger back territory tributary to Oakland by rail and highway embraces the main central portion of the great agricultural valleys of the Sacramento and San Joaquin Rivers.

4. *Outer harbor.*—Originally the outer harbor of Oakland was a broad flat, extending out from the shore some 2 or 3 miles to deep water in the bay. In order to reach water of sufficient natural depth for the operation of ferries between Oakland and San Francisco, the various railroad companies have constructed solid-fill moles and trestles, extending from shore 1¼ to 3 miles out into the bay. These moles divide the outer harbor into three divisions: The Southern Pacific Basin, on the south, between the Western Pacific and Southern Pacific moles; the Key Route Basin, between the latter mole and the Key System Pier; and the area, not specifically named, north of the Key System Pier, south of the Alameda mole, or south training wall at the entrance to the inner harbor, there is also the so-called Alameda naval base site, fronting on the city of Alameda. This area is not, however, included in the scope of this report.

5. *Inner harbor.*—The inner harbor includes the tidal estuary, known as San Antonio Estuary, Brooklyn Basin, and the tidal canal connecting the estuary with San Leandro Bay. The westerly end of San Antonio Estuary, for a distance of about 2 miles, is an entrance channel, protected by two stone training walls from 750 to 850 feet apart.

6. *San Leandro Bay.*—San Leandro Bay is roughly triangular in shape, with an area of about 440 acres inside the high-water line. It is connected with San Francisco Bay by the tidal canal, as described above, and also by a natural inlet to the southwest, between Bay Farm Island and the city of Alameda. The latter entrance is not practicable for navigation on account of the long stretch of shoal water south of Alameda, between San Leandro Bay and deep water in San Francisco Bay. Except for small areas in San Leandro Bay adjacent to the two entrances, where the water is from 12 to 18 feet deep, and a very narrow and shallow channel between these entrances, the bay is practically dry at low tide. There are three sloughs tributary to San Leandro Bay—East Creek Slough, East

[1] Not printed.

Creek, and San Leandro Creek, on the northeast, east, and southeast, respectively. These sloughs are practically dry at low tide.

II. PREVIOUS REPORTS

7. The first report on Oakland Harbor was submitted by a board of engineers on February 16, 1874, and is printed in House Executive Document No. 174, Forty-third Congress, first session, as well as in the Annual Report of the Chief of Engineers for 1874, Part II, page 378. This report was favorable, and recommended the construction of two stone training walls at the mouth of San Antonio Estuary, the dredging of a channel between these training walls and of a tidal basin at the upper end, the construction of a canal between this tidal basin and San Leandro Bay, and a dam across the entrance to San Leandro Bay, at a total estimated cost of $1,814,529.20.

8. The next report was made by Lieut. Col. W. H. Heuer, Corps of Engineers, under date of December 19, 1900, and printed in House Document No. 262, Fifty-sixth Congress, second session, and in the Annual Report of the Chief of Engineers for 1901, page 3434. This report was also favorable and presented three alternative estimates of improvement of San Antonio Estuary and Brooklyn Basin. The plan adopted provided for a channel 500 feet wide and 25 feet deep from San Francisco Bay to Chestnut Street; thence 300 feet wide and 25 feet deep to Fallon Street; thence 300 feet wide and 17 feet deep to the tidal or Brooklyn Basin; thence 300 feet wide and 12 feet deep around Brooklyn Basin; all at an estimated cost of $968,203.

9. The next report was made by the Board of Engineers for Rivers and Harbors on January 11, 1907, printed as House Committee Document No. 9, Fifty-ninth Congress, second session. This report recommended the completion of the project previously adopted and the removal of certain restrictions as to channel width imposed by Congress.

10. On December 10, 1909, Lieut. Col. John Biddle, Corps of Engineers, submitted a report, printed as House Document No. 647, Sixty-first Congress, second session, which recommended a channel 500 feet wide and 30 feet deep from the bay to the tidal basin, a channel 300 feet wide and 25 feet deep around the tidal basin, and a channel 18 feet deep along the tidal canal, at an estimated cost of $1,100,000.

11. An unfavorable report on a preliminary examination of San Leandro Bay was submitted by Lieut. Col. Thos. H. Rees, Corps of Engineers, February 17, 1914, and was printed in House Document No. 911, Sixty-third Congress, second session.

12. The next report on Oakland Harbor was submitted October 5, 1917, by Colonel Heuer, and printed as House Document No. 1131, Sixty-fifth Congress, second session. The report recommended no modification of the existing project, except the inclusion for maintenance, up to within 75 feet of the pierhead line, of the area along the south side of the Government channel, from Harrison Street eastward, where abutting property owners had dredged out to the Government channel and to project depth.

13. The last report on Oakland Harbor was made in connection with a report also on Berkeley and Albany Harbors, by Col. Herbert

Deakyne, November 10, 1921, and printed in House Document No. 144, Sixty-seventh Congress, second session. This report was favorable and recommended the present project.

III. EXISTING PROJECT

14. The existing project provides for a channel 30 feet deep and 800 feet wide through the shoal southeast of Goat Island, narrowing to 600 feet at the ends of Oakland jetties; a channel from the ends of the jetties to Webster Street 30 feet deep and 600 feet wide, with additional widening to the pierhead line in front of the municipal wharf; a channel from Webster Street to Brooklyn Basin 30 feet deep and 500 feet wide; the south channel of Brooklyn Basin 30 feet deep and 500 feet wide; a turning basin at the east end of Brooklyn Basin 30 feet deep, 500 feet wide, and 1,200 feet long; a channel in the tidal canal, from the Brooklyn Basin to Park Street, 30 feet deep and 275 feet wide; above the Park Street bridge 18 feet deep and 300 feet wide through the tidal canal to San Leandro Bay, making a total length of 9⅛ miles; parallel rubble-mound jetties at the entrance, a north jetty 9,500 feet long and a south jetty 12,000 feet long; the maintenance of the existing north channel through Brooklyn Basin 25 feet deep and 300 feet wide up to the dike to be built by local interests at the foot of Dennison Street; the maintenance to project depth and to within 75 feet of the pierhead line of the area along the south side of the channel, from Harrison Street eastward to Brooklyn Basin; and three highway bridges across the tidal canal, constructed by the United States and operated and maintained by local authorities. The river and harbor act of September 22, 1922, provides that no work shall be done above the Webster Street and Harrison Street bridges until those bridges have been removed or so altered, in accordance with plans approved by the Secretary of War and the Chief of Engineers, as to provide suitable facilities for navigation. The above provision was amended by the river and harbor act of March 3, 1925, stipulating that no work shall be done above the Webster Street and Harrison Street bridges until the Secretary of War and the Chief of Engineers shall have received satisfactory guaranties that those bridges will be removed or so altered, in accordance with plans approved by them, as to provide suitable facilities for navigation.

15. The estimate of cost of new work made in 1921 and adopted by the river and harbor act of September 22, 1922, was $1,371,450, but has since been revised, in 1925, to $810,000. The latest (1921) estimate for annual maintenance of the entire project is $60,000.

16. The various items of the existing project were authorized by the following river and harbor acts: The jetties, by the act of June 23, 1874; the present channel from Webster Street to Brooklyn Basin, the north channel in Brooklyn Basin, and the channel in the tidal canal east or upstream of Park Street, by the act of June 25, 1910; the maintenance of the area along the south side of the channel from Harrison Street to Brooklyn Basin, by the act of March 2, 1919; the present channel across the shoal southeast of Goat Island and thence to Webster Street, the south channel in Brooklyn Basin, the turning basin at the east end of Brooklyn Basin, and the channel in the tidal canal from Brooklyn Basin to Park Street, by the act of September

22, 1922. The drawbridges across the tidal canal were required by the decree of the court in the condemnation proceedings whereby title was obtained to the right of way for the canal. The latest published map is found in House Document No. 1131, Sixty-fifth Congress, second session.

17. The existing project has been completed except for the widening and deepening of the south channel in Brooklyn Basin and of the tidal canal to Park Street, and for a small amount of work in the vicinity of the Webster Street bridge. A contract for the work in Brooklyn Basin and the tidal canal has been let and it is expected that this work will be completed late in 1926.

IV. WORK HERETOFORE DONE

18. The only work heretofore done in Oakland Harbor by the Federal Government has been in the inner harbor. This work began in 1874 with the construction of two parallel training walls over the shoal at the entrance to the harbor and the dredging of a channel between these training walls and of a tidal basin at the head of the harbor to increase the tidal prism. Later, the training walls were built higher and made into jetties; the channels were extended and deepened; a canal was dug from the tidal basin to San Leandro Bay and three bridges were built across it; channels were dredged around the Brooklyn Tidal Basin and an island, known as Government Island, was built in the middle of the basin with material dredged from these channels. The total amount expended by the Federal Government on this work to October 1, 1925, has been $5,565,020.18.

19. In addition to the improvements made by the Federal Government, a large amount of dredging has been done in the inner harbor by private interests. This dredging includes the area north of the Government channel, between the Southern Pacific Peralta Street Slip and Clinton Basin, and south of this channel, between a point about 1,500 feet west of Webster Street and Chestunt Street, Alameda, a distance of about 2½ miles on each side of the channel. Other dredging has been done by private interests at the western Pacific mole, adjacent to the entrance channel; in the north channel in Brooklyn Basin; and in the tidal canal. A large amount of this dredging has been to the same depth as the adjacent Government channel, but at some points it is greater or less than the adjoining project depth. The total amount expended by private interests in this work in the inner harbor is estimated to be $2,263,500 to June 30, 1925, of which amount $1,150,700 covered work done east of the Harrison Street Bridge, and $1,112,800 west thereof.

20. In the outer harbor the city of Oakland has dredged an entrance channel 25 feet deep and 200 feet wide from deep water east of Goat Island into the Key Route Basin, connecting with a channel, also dredged by the city, along the bulkhead on the easterly side of the basin. This entrance channel has become inadequate, and the city is now engaged in enlarging it to 30 feet deep and 250 feet wide, which work will be completed about December 1, 1925.

V. PRESENT CONDITION

21. There is a channel 800 feet wide, with a controlling depth of 30 feet at mean lower low water, across the shoal southeast of Goat Island; thence narrowing to 600 feet and with a controlling depth of 30 feet to the western Pacific mole; thence 600 feet wide and from 27 to 30 feet deep to Webster Street, with an additional widening to the pierhead line in front of the Oakland municipal quay wall.

22. Between Webster Street and Harrison Street, due to the bridge at these streets, there are two channels, each 115 feet in width and 30 feet deep. The Harrison Street bridge has been removed, but the channel at this point has not as yet been widened to full project width.

23. East of Harrison Street and between that street and Brooklyn Basin the channel is from 500 to 1,100 feet in width, with controlling depths of 29 feet in the 500-foot-wide Government channel and from 20 to 31 feet in the adjacent privately dredged channel area.

24. There are two channels, each 300 feet wide, through Brooklyn Basin, with controlling depths of 13 feet in the north channel and 25 feet in the south channel of the basin. In accordance with the existing project, a contract has been let for dredging the south channel 500 feet wide and 30 feet deep at mean lower low water. This work has begun and will probably be completed in the fall of 1926. In the middle of Brooklyn Basin lies Government Island, about 76 acres in extent, built up almost entirely by deposits from Federal and private dredging in this vicinity.

25. The greater portion of the tidal canal consists of a channel 300 feet wide and 18 feet deep. The westerly end, from Brooklyn Basin to Park Street, is being deepened, under the existing project, to 30 feet for a width of 275 feet.

26. In the outer harbor there is a channel 150 feet wide and 30 feet deep, dredged by local interests, extending from deep water east of Goat Island to the bulkhead in the Key Route Basin.

VI. DESIRES OF LOCAL INTERESTS

27. A public hearing was held in Oakland, June 23, 1925, at which plans and arguments for the further improvement of the harbor were presented by local interests. In addition, the district engineer has had considerable correspondence and has held a number of conferences on the subject. A stenographic report of the public hearing and copies of the arguments and plans submitted at this hearing accompany this report, inclosure 2.[1]

28. The desires of local interests are expressed mainly in requests received from the cities of Oakland and Alameda, the Oakland-Alameda Harbor Association and the Alameda Chamber of Commerce, as follows:

29. The city of Oakland, by letter dated June 23, 1925, inclosure 2, Exhibit A,[1] and the city of Alameda, by letter dated June 22, 1925, inclosure 2, Exhibit A–1,[1] recommend—

(*a*) The deepening of the present channel across the Goat Island shoal and to the end of the jetties to 35 feet at mean lower low water.

(*b*) The construction of an approach channel 800 feet wide and 35 feet deep to the outer harbor (Key Route Basin).

[1]Not printed.

(*c*) The enlargement of the channel, from the end of the jetties to the westerly end of Government Island, to 600 feet in width and 33 feet in depth.

(*d*) The deepening of the existing channel in the tidal canal, above the Park Street Bridge, to 25 feet.

(*e*) The acquirement of an additional 200-foot width of right of way bordering the tidal canal, in order to facilitate its future deepening to 30 feet over an adequate width.

(*f*) The reconstruction of bridges over the tidal canal, with foundations of adequate depth, and with adequate clear openings.

In addition, the city of Alameda requests:

(*g*) An adequate turning basin at the westerly end of Government Island 33 feet deep.

(*h*) The inclusion in the present examination and survey of the area of tide lands south of the Alameda Mole. (The definite improvements desired are not stated.)

30. The Oakland-Alameda Harbor Association, by letters dated June 18 and 23, 1925, inclosure 2, Exhibits D [1] and D–1 [1] in addition to joining in requests for items *a* to *g* above, requests the following work:

(*i*) The maintenance, to whatever project depth may be adopted for the adjacent channel, of the area south of the channel and to within 75 feet of the pierhead line, between Harrison Street and Harbor Line Point No. 58, which latter is located on the south side of Brooklyn Basin, approximately on the prolongation of Nautilus Street, Alameda.

(*j*) The dredging of a channel from the tidal canal up East Creek Slough.

(*k*) The construction of a channel along the Alameda shore of San Leandro Bay, from the tidal canal to Bay Farm Island bridge.

(*l*) The construction of a turning basin, of tidal canal project depth, between pierhead lines at the entrance to the tidal canal at San Leandro Bay.

31. The Alameda Chamber of Commerce, by letters dated June 19, 1925, inclosure 2, Exhibits F [1] and G,[1] in addition to requesting the construction of a turning basin at the westerly end of Government Island (see *g* above), requests:

(*m*) The widening of the existing south channel in Brooklyn Basin to 1,000 feet.

32. In addition, numerous other letters have been received indorsing one or more of the above requests, in whole or in part, and citing instances to show the need thereof.

VII. EXISTING COMMERCE

33. The commerce of Oakland Harbor for the past five years has been as follows:

Year	Tons	Value	Ferry passengers	Year	Tons	Value	Ferry passengers
1920	1,716,332	$132,653,552	43,103,849	1923	2,081,929	$122,702,667	43,925,246
1921	1,945,422	113,964,997	41,625,502	1924	2,216,527	84,113,773	39,460,607
1922	2,111,917	95,572,811	35,397,732				

[1] Not printed.

34. The character and quantity of the commerce in Oakland Harbor is indicated by the following summary of water-borne commerce for 1924:

Classes of commodities	Foreign			
	Import		Export	
	Tons	Value	Tons	Value
Animals and animal products	3,558	$725,959		
Vegetable food products	68,955	5,633,575	17,490	$3,410,882
Wood and paper	10,242	2,496,957	2,786	135,436
Nonmetallic minerals	39,729	962,884	9,808	88,580
Ores, metals, and manufactures of	5,054	343,672	839	51,052
Chemicals	14,763	599,650	411	16,440
Unclassified	1,462	77,486	7,326	388,278
Total	143,763	10,840,183	38,660	4,090,668

Classes of commodities	Domestic				Total foreign and domestic	
	Coastwise		Other domestic		Tons	Value
	Tons	Value	Tons	Value		
Animals and animal products	18,329	$5,865,280	17,964	$5,652,380	39,851	$12,243,619
Vegetable food products	5,824	524,160	146,314	17,857,064	238,583	27,425,681
Wood and paper	531,255	9,814,787	5,630	294,226	549,913	12,741,406
Nonmetallic minerals	33,547	1,655,825	970,977	6,988,068	1,054,061	9,695,357
Ores, metals, and manufactures of	6,636	457,828	12,985	2,376,824	25,514	3,229,376
Machinery and vehicles			2,556	2,556,000	2,556	2,556,000
Chemicals	168	6,720	3,539	379,620	18,881	1,002,430
Unclassified			278,380	14,754,140	287,168	15,219,904
Total	595,759	18,324,600	1,438,345	50,858,322	2,216,527	84,113,773

General ferry, 290,582 short tons; 39,460,607 passengers; 1,300,266 automobiles; 5,717 motor cycles; 28,51[illegible] teams; 8,802 trailers and other vehicles; and 1,222 head of stock. Railroad car-ferry, 700,873 short tons.

35. *Vessel classification, 1924*

Classes of vessels	American (number)	Foreign (number)	Total number	Total net registered tonnage
Arrivals:				
Steamers	3,382	170	3,552	4,005,732
Motor ships	607	7	614	53,390
Sailing vessels	77	1	78	109,543
Barges and lighters	4,838		4,838	574,533
Gasoline launches	2,425		2,425	54,835
All others	730		730	10,590
Total	12,059	178	12,237	4,808,623
Departures:				
Steamers	3,361	163	3,524	3,997,714
Motor ships	607	7	614	53,390
Sailing vessels	63	1	64	102,257
Barges and lighters	4,821		4,821	513,911
Gasoline launches	2,399		2,399	52,375
All others	728		728	10,220
Total	11,979	171	12,150	4,729,867
Total	24,038	349	24,387	9,538,490

36. *Trips and drafts of vessels, 1924*

Draft (feet)	Trips inbound					
	Steamers	Motor vessels	Sailing	Barges and lighters	Gasoline launches	All others
28 to 30	2					
26 to 28	5		1			
24 to 26	20					
22 to 24	94			4		
20 to 22	205			9		
18 to 20	552		17	15		
16 to 18	560		11	9		
14 to 16	645	4	11	4		
12 to 14	699	5	15	18		
10 to 12	276	125	7	31	1	
8 to 10	127	23		223		
6 to 8	145	201		218	213	
Less than 6	222	256	16	4,307	2,211	730
Total	3,552	614	78	4,838	2,425	730

Draft (feet)	Trips outbound					
	Steamers	Motor	Sailing	Barges and lighters	Gasoline launches	All others
28 to 30	2					
26 to 28	4		1			
24 to 26	17					
22 to 24	91			4		
20 to 22	192			7		
18 to 20	535		11	14		
16 to 18	532		3	7		
14 to 16	604	4	23	4		
12 to 14	676	5	19	13		
10 to 12	222	125	5	26		
8 to 10	55	22		223		
6 to 8	75	250		393	216	
Less than 6	519	208	2	4,130	2,183	728
Total	3,524	614	64	4,821	2,399	778

37. It is expected that the commercial statistics for the full calendar year 1925 will show a considerable increase over those of 1924, both in total amount of commerce and in the number of vessels of deep draft using the waterway, due to the opening during the year of new terminals for general commerce and for bulk oil.

VIII. INCREASED COMMERCE TO RESULT FROM IMPROVEMENT

38. There has been in the past five years a steady and healthy growth in the water-borne commerce of Oakland Harbor. The opening of extensive, recently constructed terminals in Oakland Harbor has resulted lately in a large increase in the number of ocean-going vessels calling at this port. The construction of additional terminals, as planned by the city of Oakland and other interests (see pars. 45 to 49 below), will in all probability result in further increase in this commerce. The existing channel dimensions are not adequate for the safe and economical operation of the large ocean-going vessels. A considerable tonnage of commerce now lightered from intercoastal and foreign-going vessels may be expected, with more adequate channel and terminal facilities, to be landed directly in Oakland Harbor, with a consequent economic saving.

IX. TERMINAL AND TRANSFER FACILITIES

39. *General.*—There are 64 wharves and landings, mostly of timber-pile construction. Eighteen of these wharves are owned by the city of Oakland, of which 13 are leased to private interests, and all are open to the general public on equal terms. The other wharves and landings are privately owned and some of them are open to water carriers on equal terms, but most of them are reserved for the exclusive use of the owners. The above facilities provide 21,400 linear feet of berthing space, of which 11,000 is for general cargo, 9,000 for lumber, and 1,400 for grain. The charges for wharfage, dockage, and cargo are practically the same as for the harbor of San Francisco. The municipal wharves and 12 of the privately owned wharves have spur-track railroad connections, as well as warehouse storage facilities. The remaining wharves have easy access to near-by railroads by highway. Seventeen wharves have warehouses or storage facilities. Practically all freight is unloaded from the vessels by ship's tackle or by derrick lighter. Some locomotive cranes and derricks are used for handling and storing freight on the wharves.

40. *Inner harbor.*—There are no terminal developments along the jetties or training walls at the entrance to the inner harbor. These portions of the water front are occupied by the tracks of two railroad companies, the Western Pacific along the north training wall and the Southern Pacific along the south, with ferry slips, for passenger ferries to San Francisco, at the outer ends. The Western Pacific Co. also handles a small amount of coastwise shipping at a wharf located just inside the entrance to the estuary and forming practically an extension of the north training wall.

On the Oakland side of the inner harbor, from the shore end of the training wall to Brooklyn Basin, practically all of the frontage is in active use. Along this length are located two terminals, the municipal quay wall and the Howard terminal, for handling overseas and intercoastal vessels; a bulk-coal terminal; one wharf and one ferry slip for handling local freight business between Oakland and San Francisco; four lumber and building-materials wharves; and three shipbuilding and repair plants.

On the Alameda side of the harbor, along this length, there are located only a building-materials wharf, an oil terminal for local business, and the Alameda plant of the Bethlehem Shipbuilding Corporation (Ltd.).

41. *Brooklyn Basin.*—The frontage along the north side of the north channel in Brooklyn Basin is only partially developed. This frontage is owned by the city of Oakland, but has been leased to various concerns and individuals as the outcome of litigation over the ownership of the frontage along this channel. These leases have some 10 or 11 years yet to run and are renewable under certain conditions. The stipulations of the leases are such as to discourage the construction of permanent improvements by the lessees. There are along this part of the water front two lumber wharves, one of which is municipally owned and open to all shippers alike, and several boat-building and repair plants.

On the south, or Alameda, side of Brooklyn Basin are located the Encinal terminals, a description of which is given in paragraph 49

of this report, an oil wharf and a building-materials wharf, two large ship-repair plants, and two smaller boat and barge building plants.

42. *Tidal Canal.*—Along the Tidal Canal are located several important lumber wharves, a number of building-material wharves, and the large grain elevator and wharf of the Oakland Terminal & Elevator Corporation.

43. *San Leandro Bay.*—The present commercial development adjacent to San Leandro Bay is confined almost exclusively to the area north of East Creek Slough. Between East Creek Slough and East Fourteenth Street, about 3,500 feet north of the slough, there are a large number of important industrial establishments, such as the National Lead Co., General Electric Co., and Coast Tire & Rubber Co. There are no commercial wharves on the water front in San Leandro Bay, the depths of water being insufficient at present for commercial navigation.

44. *Outer harbor.*—In the Key Route Basin are located the Albers Bros. Milling Co., which does an important grain-shipping business; the Parr Terminal, a shipping terminal handling coastwise, intercoastal, and overseas shipping; the Union Construction Co.; and two oil terminals, the General Petroleum Corporation and the Richfield Oil Co.

In the Southern Pacific Basin the Southern Pacific Co. has three wharves, principally for the handling of lumber.

X. TERMINAL IMPROVEMENTS CONTEMPLATED

45. Extensive plans are being made by municipal and corporate interests for the commercial development of Oakland Harbor. The growth of intercoastal water-bourne commerce and the favorable location of this harbor, on the continental side of San Francisco Bay, have brought a demand for terminal facilities beyond the capacity of the existing terminals. The region adjacent to the harbor is also making rapid strides in industrial development, resulting in more water-bourne commerce and greater demands for terminals. As a result, several definite and concrete plans for the construction of more terminal facilities are being made.

46. *Contemplated developments by city of Oakland.*—In November, 1924, the city of Oakland engaged a board of engineers to make a thorough study of the commercial needs of Oakland Harbor and to recommend a plan for the development of the city-owned property in the harbor. This board has been handicapped by the fact that a large amount of the city frontage is under lease for a term of years to private and corporate interests. In many cases the lessees have done little or nothing toward developing their frontage, but nevertheless are unwilling to surrender their leases. The problem is further complicated by litigation between Oakland and Alameda over the boundary line between the two cities in Brooklyn Basin, where the dredging away of a projecting point of land and the later construction of Government Island by dredged spoils has raised a question as to the location of the common boundary line.

The city's board of engineers has recently rendered a preliminary report, a copy of which is inclosed with this report (inclosure 4)[1], in

[1] Not printed.

which there is recommended the immediate construction of a long quay wharf and transit shed in the Key Route Basin; two solid-fill piers at the municipal quay wall, between the foot of Grove and Washington Streets, in the inner harbor; and one large mole pier in Brooklyn Basin, projecting about 1,700 feet from the existing harbor lines on the Oakland side of the basin. The proposed construction at the municipal quay wall and in Brooklyn Basin are contingent on certain changes, not yet approved by the War Department, in the harbor lines in these localities. The total estimated cost of the recommended construction is $9,960,000. A bond issue of this amount, to cover the cost of the proposed construction, was authorized by an election held for this purpose on November 10, 1925.

47. *Contemplated developments by city of Alameda.*—The city of Alameda has likewise recently appointed a board of engineers to study and recommend a plan for the development of port facilities for that city, utilizing the area of tide lands south of Alameda mole, sometimes known as the Alameda navy base site. This area is only partially reclaimed at present, but as it is practically the only remaining dumping ground for hydraulic pipe-line dredge spoils in this locality, its reclamation from now on will probably be rapid.

48. *Private development on Alameda side of estuary.*—East of the Alameda Navy Base site, between that locality and Webster Street, the Alameda water frontage, in the form of a long, comparatively narrow strip, is owned by the Southern Pacific Co. Behind this railroad-owned frontage is a large area of reclaimed land (tract 39), owned by the University of California. It is understood that plans have been prepared for the joint development of these two tracts by the university and the railroad company.

49. Near the westerly end of Brooklyn Basin, in Alameda, there has been opened in the past year an important terminal called the Encinal Terminals. The company has dredged a slip, known as Alaska Basin, 1,600 feet long, about 400 feet wide, and 30 feet deep, southerly from the combined pierhead and bulkhead line at this point, and has constructed an L-shaped wharf along the entire length of the east side of this basin and for a length of 400 feet along the south channel in Brooklyn Basin. There are two transit sheds on this wharf, each 700 feet long and 140 feet wide, with two spur tracks on the open wharf in front of the transit sheds and two depressed tracks behind them. The business at this terminal has already grown to such size that plans are now being prepared for the continuation of the wharf along the south channel in Brooklyn Basin to Fortman Basin and along the full length of the west side of Fortman Basin. The plans of this company call for the ultimate construction of two additional slips, faced with wharves, in Fortman Basin, and possibly the dredging of a fourth slip between Fortman Basin and Grand Street, Alameda.

50. *Belt-line Railroad.*—During the war the city of Alameda constructed a belt-line railroad on Clement Avenue, from the Southern Pacific tracks, at Broadway, to Grand Street. This line serves several industries along its length and connects at the westerly end with the tracks of the Alaska Packers' Association and the Encinal Terminals. Recently the city sold this belt line to a holding company, consisting of the Santa Fe and Western Pacific Railroads, with the stipulation that any other railroad may enter the holding

company by paying its proportionate share of the costs of the belt line. The sale has been approved by the State railroad commission and is now before the Interstate Commerce Commission for ratification. If approved, the belt line railroad plans to build a car-ferry slip on the former Liberty Shipyard tract, just west of the Encinal Terminals, and also to extend the belt line to the city-owned tide-land tract south of Alameda Mole.

51. The value of a belt-line railroad in Oakland, serving all the wharves in the city and connecting with the existing trunk-line railroads, is recognized by the city authorities, who are studying this subject at this time. At present practically all rail connections to the wharves are over the Southern Pacific Railroad. In the inner harbor, both the Southern Pacific and the Western Pacific Railroads extend adjacent to the harbor for a considerable distance. The Santa Fe Railroad also has a freight yard on the inner harbor, connected by car ferry to the terminus of this railroad at Richmond. The construction of a belt line along the inner harbor, connecting with the existing tracks of these three railroads, and also connecting by means of the Fruitvale Avenue Bridge with the Alameda Belt Line would be of great benefit to the harbor and would seem to be at this time a feasible undertaking.

XI. BRIDGES AND OTHER OBSTRUCTIONS

52. There are four drawbridges across the inner harbor, consisting of the Webster Street Bridge across the estuary, and the Park Street, Fruitvale Avenue, and High Street Bridges across the tidal canal. There are two channels 115 feet wide and 30 feet deep through the Webster Street Bridge. A vehicular tube with a clearance of 40 feet at mean lower low water for a channel width of 725 feet is being built by the county to replace the Webster Street Bridge, which it is expected will be completed by December 31, 1927, and the Webster Street Bridge thereafter removed.

53. The three bridges across the tidal canal were built by the Federal Government pursuant to a decree of the court in the condemnation proceedings by which the right of way for this canal was acquired. On November 17, 1913, these bridges were placed under control of the board of supervisors of Alameda County, which assumed all cost of future operation, repair, and replacement. The most westerly of these bridges, the Park Street Bridge, has a clear opening of 134 feet on each side of the pivot pier. This bridge is reported in poor condition and will probably have to be replaced. The next bridge, at Fruitvale Avenue, about 2,100 feet farther east, is a combined railroad and highway bridge, with a clear opening of only 63 feet. The High Street Bridge is a highway bridge about 2,200 feet farther east. This bridge has only 63 feet clear opening and, moreover, makes an angle of about 23° with the radius of the canal at this point. Considerable difficulty has been experienced by vessels navigating through this bridge, which is usually only attempted against the tide. The footings of all three bridges extend to only about 19 feet below mean lower low water; consequently, any greater depth of waterway than the existing project depth of 18 feet would require replacement or extensive alterations of these bridges.

XII. OTHER COMMUNICATIONS

54. *Near-by ports.*—On San Francisco Bay there are, in addition to Oakland Harbor, three ports handling intercoast and foreign commerce. These are San Francisco, Richmond, and the warehouses along Carquinez Strait.

The ocean commerce of Richmond consists principally of petroleum products and that of Carquinez Strait of raw sugar and grain. General cargo, either for local distribution or for transshipment to interior points, is handled principally in San Francisco and Oakland Harbor.

55. *Connecting waterways.*—The rivers and tidal estuaries tributary to San Francisco Bay furnish a means of communication by water between the ports on San Francisco Bay and the territory adjacent to these various tributary waterways. Oakland Harbor is thus connected by river boats with Sacramento, Stockton, Petaluma, and other interior points. A considerable tonnage of freight, particularly canned goods, is thus brought to Oakland Harbor for shipment in ocean vessels.

56. *Railroads.*—As previously stated in paragraph 3, Oakland is the terminus of two transcontinental railroads, the Southern Pacific and Western Pacific and of the Sacramento Short Line Railroad, an electric line serving the north-central portion of the Sacramento Valley. The terminus of the Santa Fe Railroad is at Richmond, about 8 miles north of Oakland. This company has a railroad line from Richmond to Oakland with a freight and passenger depot at Fortieth Street and San Pablo Avenue, Oakland. This line does not connect with the waterfront at Oakland, but the company has a freight yard and wharf on the Oakland Inner Harbor, connected by car float with the terminus of the railroad at Richmond. By means of these various railroads Oakland is connected by trunk lines to practically all points in the great interior valley of California and to the States to the east and southeast. It is also connected by rail through the Sacramento Valley northward to Portland, Oreg., and Seattle, Wash., and both by the coast and San Joaquin Valley routes south to Los Angeles and southern California.

57. *Highways.*—Oakland is connected by a system of paved highways with the various portions of the State of California, including the Sacramento and San Joaquin Valleys to the east and the Santa Clara Valley to the South. Regular motor-truck lines connect Oakland with points in the San Joaquin Valley. A large amount of agricultural products is brought to Oakland by these motor-truck lines. A considerable quantity also of canned goods from the fruit canneries in the Santa Clara Valley is brought by motor truck to shipping terminals in Oakland and Alameda for transshipment.

58. *Transbay communications.*—There are no bridges at present between Oakland and San Francisco. Direct communication is entirely by means of passenger and automobile ferries. The various railways from the East carry freight into San Francisco by car ferry, except that the Southern Pacific has in addition a freight line into San Francisco by means of the so-called Dumbarton Cut-Off, crossing the bay about 26 miles south of San Francisco. A highway bridge is now under construction at the same location. At present the shortest highway connection between Oakland and San Francisco is around the southern arm of San Francisco Bay, a distance of 83.7 miles.

XIII. NECESSITY FOR ADDITIONAL CHANNEL IMPROVEMENT OF OAKLAND HARBOR—DISCUSSION

59. The entrance channel dredged by local interests into the Key Route Basin is indirect, narrow, and crosswise to the tidal currents. Vessels proceeding into the basin from San Francisco Bay, after crossing Goat Island Shoal, must make an abrupt turn to the north and then turn abruptly again into the entrance channel. The shape of the channel is due to the fact that at the time it was originally dredged there was a so-called "long wharf," for deep-water shipping, extending from Oakland Mole westward to deep water. The entrance channel was at that time necessarily dredged around the end of this wharf, which was removed in 1920, thus making it now possible to construct a direct channel from the easterly end of the channel across Goat Island Shoal into the Key Route Basin. Such a channel would undoubtedly benefit navigation into the basin. The recent increase of terminal facilities and commerce in this portion of the harbor appears to merit thorough study of the need for channel improvement to the outer harbor.

60. In the inner harbor the present project channel dimensions to Park Street would be barely sufficient for the immediate needs of commerce in this harbor if the channel could always be maintained to full project depth. This is impracticable, however, without an uneconomical expenditure of funds for frequent maintenance dredging. The opening of the Encinal Terminals has brought about a marked increase in the number of large vessels using the channels above Webster Street. These vessels have been handicapped by the deterioration of channel depth, as well as by lack of width in the Government channel opposite the mouth of Alaska Basin. To remedy these conditions, as well as to provide for a reasonable increase in commerce and size of ships in the near future, appears to warrant some increase in the channel dimensions now authorized.

61. The draft of vessels carrying lumber has increased until the 18-foot depth of the tidal canal is no longer adequate to accommodate a number of regular coastwise lumber carriers which would otherwise use this waterway. It is claimed by the lumber companies in the tidal canal that a large amount of lumber consigned to them must be transferred to barges on account of the insufficient depth in the canal. Deeper water in the tidal canal, together with the provision of adequate clearances through the bridges over this waterway, would also stimulate the development, by dredging and reclamation, of the San Leandro Bay region.

62. The present right of way in the tidal canal is sufficient for a channel 350 feet wide, should a channel of this width ultimately become necessary. While the cost of acquiring additional right of way for still greater widening in the future might and probably would be excessive and out of proportion to the benefits to be obtained, the subject appears to warrant full investigation and study, in order to adopt now whatever plan will probably most economically and effectively serve the ultimate needs of the development of the harbor.

XIV. WATER POWER AND RELATED SUBJECTS

63. Material excavated from the tidal canal could be used for the reclamation of a certain amount of tide lands lying south of the high land of Alameda, between Park Street and the Bay Farm Island Bridge. The value of these spoils for this purpose is not great, but would probably reduce somewhat the cost to the United States of doing the dredging in this canal. Likewise, the material excavated from channels which might be dredged in San Leandro Bay would reclaim valuable land along the shores of the bay.

64. The plans of the city of Oakland for the construction of piers in Brooklyn Basin contemplate the removal of a part of Government Island and the widening of the south channel in Brooklyn Basin. The spoils from the dredging would be used to build the piers and for filling the existing north channel.

65. With the exception of the above items of reclamation, there are no questions of water power, or other related subjects, which could be coordinated with the proposed work so as to lessen any expenditure that may be necessary in the interests of navigation.

XV. LOCAL COOPERATION

66. Under the provisions of the river and harbor act of June 25, 1910, local interests bear the expense of operation and maintenance of the three drawbridges across the tidal canal.

67. The river and harbor act of March 2, 1919, authorized the maintenance of an area along the south side of the channel in Oakland estuary from Harrison Street to Brooklyn Basin after the dredging of such area to project depth by local interests. The area has been dredged by those interests at a cost of $256,965.

68. Under the provisions of the river and harbor act of September 22, 1922, local interests were required to construct and maintain a dike across the north channel in Brooklyn Basin, provide free of cost to the United States any necessary right of way for dredged channels and suitable dumping grounds for dredged material. This act, as amended by the river and harbor act of March 3, 1925, also required that no work should be done above the Webster Street and Harrison Street Bridges until the Secretary of War and the Chief of Engineers received satisfactory guarantees that those bridges would be removed or so altered, in accordance with plans approved by them, as to provide suitable facilities for navigation. The Harrison Street Bridge has been removed and the necessary assurances with reference to the Webster Street Bridge have been accepted by the Secretary of War and Chief of Engineers.

69. Except for the above-mentioned items of local cooperation, required by the authorized projects for Oakland Harbor, the Federal Government has borne the entire expense of the work done under such projects for the improvement of this harbor to date.

70. A large amount of money has been expended by local interest, however, in improvements adjacent to the Government channel. In some instances these improvements have been of benefit to general navigation. Examples are the channels dredged by the city of Oakland into the Key Route Basin and by private interests in the area south of the Government channel, between Harrison Street and

Harbor Line Point 58. The construction of the estuary tube, to replace the Webster Street Bridge, at a contract cost of $3,882,000 will greatly aid navigation, as well as land traffic. See also paragraphs Nos. 45 to 49, for work done and planned by local interests in the matter of terminal and shore developments.

71. No offers have been made by local interests to contribute a portion of the increased costs of carrying out the additional channel improvements now desired by such interests, except possibly in the dredging of channels desired in San Leandro Bay. As a portion, at least, of the improvements desired would be of large local benefit, it seems reasonable to expect that some of the costs of such improvements, if found justified, should and would be met locally. The proposed dredging in Brooklyn Basin by the city of Oakland, in accordance with the plan for the construction of the mole piers as outlined above in this report, will, if approved and carried out, provide a wide, deep channel for all commerce in this locality, and may be considered as a local contribution to an enlarged project. The replacement of the bridges over the tidal canal, should a greater depth be found necessary in this waterway, and the acquisition of additional width of right of way for the tidal canal, should further study indicate this to be advisable, may also be considered proper measures of local cooperation. See also paragraphs 63 and 64 above, with respect to disposal of dredged material in the carrying out of certain improvements.

XVI. CONCLUSIONS AND RECOMMENDATIONS

72. The increased commerce in Oakland Harbor, and more particularly the commerce that is expected to result from the additional terminal facilities now planned, necessitates greater channel facilities than the existing project provides. The number of deep-draft vessels calling at terminals in the harbor is growing. The importance of San Leandro Bay as a site for industrial expansion warrants a thorough study of the costs and benefits to be derived from a channel of greater depth in the tidal canal.

73. I therefore report that in my opinion further improvement by the Federal Government of the channels of Oakland Harbor, in coordination with the extensive plans of local interests for the development of terminal facilities, appears to be warranted, and I recommend a survey upon which to base a plan of such improvement and estimate of cost.

JOHN W. N. SCHULZ,
Major, Corps of Engineers, District Engineer.

[First indorsement]

OFFICE DIVISION ENGINEER, PACIFIC DIVISION,
San Francisco, Calif., December 23, 1925.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The division engineer concurs with the district engineer that a survey should be made on which a plan of improvement may be based and its cost determined. The port of Oakland with its adjacent waters and communities is exceptional in its promise of growth and

increasing importance, by reason of its geographical location, its access to the sea, its relation to transcontinental railroads, and its opportunity for growth. This promised importance can not become a reality unless seagoing commerce can reach the port of Oakland, and every practicable effort should be made to aid its development. The city of Oakland is planning to do its share. It seems clear that the Federal Government should make a survey to determine what its share may properly be.

2. It may be argued that considerable depths in entrance channels now exist. Greater depths, nevertheless, seem desirable because maintenance of the existing channels can be best assured by overdepth dredging. Further, greater depths of channel appear needed if the full extent of the potential commerce of Oakland is to be reached.

3. The commercial statistics of Oakland Harbor for the calendar year 1925 will be valuable in considering the question of further Federal improvement of the harbor channels. These statistics should be collected and studied while the prospective survey and report are being made.

G. R. LUKESH,
Lieutenant Colonel, Corps of Engineers, Division Engineer.

[Third indorsement]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., January 11, 1926.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The board recommends a survey to determine the desirability and extent of further improvement.

2. The report of preliminary examination does not, as contemplated in O. & R., contain data on which it is possible to base a decision as to the economical benefits and utility of the Federal improvements proposed by local interests, or those which the district engineer may consider desirable. This may have been due to the incomplete character of the local plans for port development. In its absence, it has been impracticable for the board to arrive at a decision as to the propriety of undertaking any of the specific items requested locally. Such material should be included in the report of survey.

3. For all improvements requested by local interests, or which the district engineer believes desirable, full and detailed computations should be submitted to show the benefits expected through increase in commerce, savings in transportation cost, stimulation of industry, and so on.

4. An especially careful investigation is desirable of the propriety of increasing channel depths above 30 feet, which has been found in general to be a satisfactory depth for the great majority of vessels operating in world trade. It appears from the maps submitted with the report that a controlling low water depth of between 28 and 29 feet now obtains up to the west end of Brooklyn Basin. In spite of this, of the presence of a 6-foot mean tide, and of the fact, stated by the district engineer, that an increasing number of large vessels

is using the Encinal terminal, the latest statistics indicate that a very small number of vessels drawing over 26 feet made use of the harbor.

5. Full discussion is desirable of the local cooperation which it is proper to demand, and which may be exepcted, in the form of cash contribution to the cost of channel work, contribution of rights of way, construction of bridges and guarantees of terminal development.

For the board:

EDGAR JADWIN,
Brigadier General, Corps of Engineers,
Senior Member of the Board.

SURVEY OF OAKLAND HARBOR, CALIF.

SYLLABUS

The district engineer recommends the deepening by the United States of the channel in Oakland inner harbor from deep water in San Francisco Bay to Brooklyn Basin, from 30 to 33 feet at mean lower low water; the widening of said channel above the Webster Street Bridge from 500 to 600 feet, with an additional triangular widening, at the western end of Brooklyn Basin, 2,700 feet long and 300 feet wide, to provide facilities for turning; the deepening of the tidal canal above Park Street from 18 to 25 feet; the dredging of an entrance channel to the pierhead line of Key Route Basin 30 feet deep and 500 feet wide; and the maintenance by the United States to within 75 feet of the pierhead line and to a depth of 30 or 33 feet, as dredged by local interests, of the area lying south of the Government channel and situated between Harrison Street and harbor line point No. 58 in Brooklyn Basin. The district engineer further recommends that the new project be known as Oakland-Alameda Harbor, Calif., and that there be required the establishment of a unified port authority for such harbor within 5 years of the adoption of the project. Of the above work, local interests should be required to pay half the cost of the entrance channel to Key Route Basin; to satisfactorily alter or remove the bridges over the tidal canal and definitely accept responsibility for future maintenance, operation, and modification of such bridges; to pay 10 cents per cubic yard toward the cost of deepening said tidal canal; to remove the sewers discharging into the north channel of Brooklyn Basin, or, in lieu thereof, to pay half of the further cost of maintenance of such channel; and to comply with other items of local cooperation, including the provision of necessary dump grounds and of certain transfer and terminal facilities in the inner and outer harbors. All at an estimated gross cost of $1,460,295 to the United States for new work and $100,650 per annum for maintenance.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE, FIRST DISTRICT,
San Francisco, Calif., May 3, 1926.

Subject: Survey of Oakland Harbor, Calif.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).

1. In accordance with instructions contained in letter, Office Chief of Engineers, dated January 22, 1926,[1] I submit the following report on survey of Oakland Harbor, Calif., called for by the river and harbor act of March 3, 1925.

I. GENERAL REMARKS

2. The preliminary examination report, submitted November 25, 1925, gave a general description of the locality and a statement of the physical and commercial conditions bearing on the necessity of the proposed improvement.

[1] Not printed

3. This survey has included the usual hydrographic and topographic features to determine the condition of the waterways under consideration and the character of the material to be removed. Reference is made to a previous report by Col. Herbert Deakyne, Corps of Engineers, submitted November 10, 1921 (H. Doc. No. 144, 67th Cong., 2d sess., pars. 9, 10, 11, and 12, pp. 20, 21), wherein a description of the general physical characteristics of the locality is given in full.

4. *Survey.*—In connection with the preparation of this report hydrographic surveys were made of the area along the Oakland side of San Francisco Bay, between Alameda Mole and the Key System pier and between Goat Island and the pierhead line of the inner harbor channel from the end of the jetties to Brooklyn Basin and of San Leandro Bay. The character of the materials in the channel recommended in this report was already known sufficiently accurately for estimating purposes from borings made in connection with previous investigations in the harbor and from previous dredging in the channels.

5. *Maps.*—Accompanying this report (inclosure 1) is a map entitled, "Oakland Harbor, California" (file 2–1–59), scale 1:20,000, on which is outlined the proposed project for this harbor as recommended in this report. The soundings shown on this map are characteristic soundings taken from surveys made in connection with the preparation of this report and other recent surveys made by this office.

6. *Datum plane.*—The datum plane to which the project for the improvement of Oakland Harbor refers is the plane of mean lower low water. Most of the time the water surface, due to tide, is above the datum plane and the available depths in the channels are correspondingly greater. Minus tides, however, are of very common occurrence, and with such tides the water line is lowered below the datum plane. A water level 1.5 feet below the datum plane is not unusual.

II. DEVELOPMENTS IN OAKLAND HARBOR

7. The outstanding developments that have occurred with respect to Oakland Harbor during the past calendar year consist of the construction of new and important terminals, the making of plans by the cities of Oakland and Alameda and by private interests for the further construction of terminal facilities, and the marked increase of the amount of commerce and of the number of deep-draft vessels calling at the harbor.

There is inclosed herewith (inclosure 2)[1] a letter from Mr. Leroy R. Goodrich, Commissioner of Public Works of the city of Oakland, dated March 1, 1926, giving a résumé of the progress which the city had made to that date in its plans for port development, and inclosing statistics showing the increase in commerce, building permits, bank clearances, etc., in Oakland during recent years.

[1] Not printed.

III. NEW TERMINALS CONSTRUCTED AND PLANS FOR FURTHER TERMINAL CONSTRUCTION

8. *Plans of the city of Oakland.*—The plans of the city of Oakland described in paragraph 46 of the preliminary examination report, are being pushed. The city has appointed a port commission, composed of business men of the city acting in an advisory capacity with the commissioner of public works, and has employed Mr. G. B. Hegardt as port manager and chief engineer, to be the administrative and executive head of the city's harbor development. Plans are now being prepared for the construction of one covered pier to spring from the municipal quay wall, in the inner harbor, and for an apron wharf 900 feet long, with a transit shed 500 feet long, in the outer harbor. A change in the pierhead line in the inner harbor, to permit the construction of two piers at the quay wall, has been authorized by the War Department, subject to the prior dredging by the city of an area on the Alameda side of the harbor adjacent to the channel to compensate for the encroachment of the modified pierhead line over an area previously dredged by the Federal Government. The city expects to undertake this dredging in the very near future.

9. *Private plans in the outer harbor.*—In the outer harbor, in addition to the construction planned by the municipality, the Parr Terminal Co. plans the immediate construction of a brick or concrete warehouse, 500 feet long by 125 feet wide, and of a transit shed 600 feet long and 150 feet wide, the latter on part of its wharf now uncovered. The Union Construction Co., located at the extreme northeast corner of the outer harbor, on March 19, 1926, asked approval of the city for the construction of a transit shed, 850 feet long and 125 feet wide on an open wharf already constructed, for handling case gasoline and oils. This marks the entry of this company, originally a shipbuilding concern, into the shipping field. The improvements planned for immediate construction in the outer harbor are more definitely described in a letter from Mr. G. B. Hegardt, port manager of Oakland, dated March 23, 1926 (inclosure 3).[1] Since the date of this letter the length of wharf planned by the city to be built in the outer harbor immediately has been reduced from 1,500 feet to 900 feet.

10. *Plans of the city of Alameda.*—In Alameda the board of engineers appointed by the city to prepare a plan for the development of the area south of the Alameda Mole has made a report recommending the dredging of five slips extending from the inner harbor into this area, each slip 1,500 feet long and 375 feet wide at the outer end, narrowing to 275 feet in width at the inner end; and the subdivision of the balance of the area into industrial sites. The plan contemplates moving the existing Southern Pacific electric rapid-transit tracks from their present location, close to the training wall along the channel, to a location about 1,500 feet south thereof, and the extension of the Alameda Belt Line Railroad westward to serve the wharves and industries to be built. The city is not in position to incur a heavy indebtedness and does not contemplate undertaking any immediate construction on the above area. This area, however, is the only available dumping ground for a large amount of dredging in Oakland Harbor, and the city plans to take advantage of any dredge-spoil dumping so as first to build up a roadbed for the new

[1] Not printed.

location of the electric railroad, and thus later to be in a position to develop or lease the water frontage in question.

The sale of the Alameda Belt Line Railroad, referred to in paragraph 50 of the preliminary examination report, has been authorized by the Interstate Commerce Commission. The new owners of the belt line (The Santa Fe and Western Pacific Railroads) are expected to extend this line shortly west to Webster Street, Alameda. A further extension to the area south of Alameda Mole is planned for the future.

11. *Inner harbor.*—The Encinal Terminals, a large new terminal on the south side of Brooklyn Basin, which was opened during the year 1925, and which is described in paragraph 49 of the preliminary examination report, has been an important factor in the increased commerce in Oakland Harbor. Not only have a large number of deep-draft vessels called at this terminal to discharge or load freight but, in addition, many of these vessels, having called at this terminal and thus being in Oakland Harbor, have also called at other terminals in the harbor and discharged or loaded lesser quantities of freight which would otherwise have been lightered across the bay at additional costs for freight and handling. The Alaska Packers Association, which owns the Encinal Terminals, has prepared plans and specifications for the extension of this terminal and contemplates, as part of such extension, the immediate construction of a wharf and transit shed along the south channel in Brooklyn Basin, between Alaska Basin and Fortman Basin.

In addition to the above, two small wharves have recently been built, and a third is now being built, in the tidal canal, all for handling building materials; and one lumber wharf has been constructed on the Oakland side of the north channel in Brooklyn Basin.

The development of the Oakland side of Brooklyn Basin and of Government Island has been retarded by the dispute between Oakland and Alameda as to the location of the boundary line between the two cities in the basin. This matter was for some years the subject of litigation between the two cities, finally being carried to the Supreme Court of the State of California. This court, according to recent press reports, has just handed down its decision finally fixing the boundary line between the two cities in the middle of the north channel in Brooklyn Basin and thus giving jurisdiction over Government Island to Alameda. The two cities have had separate plans for the development of Brooklyn Basin, Oakland's plan being to dredge away the southern portion of Government Island and to construct a number of large solid-fill piers, extending from the present Oakland shore to within about 1,200 feet of the pierhead line on the Alameda side of the south channel, while the plan of Alameda contemplates an apron wharf around the island, approximately along the present high-water line, and the subdivision of the central portion of the island into industrial sites. Each plan contemplates the ultimate construction of about 13,000 linear feet of deep-water berthing space, with transit sheds and associated terminal facilities, which conveys an idea as to the possibilities of this area. A further complication in the matter of port development on Government Island is the lease to the island held by the Department of Agriculture of the Federal Government. Now that the litigation over the jurisdiction over the island has been adjudicated, it is expected that the Department of Agriculture will be requested to release at least a

portion of the island, not used by the activities of the department and thus permit the construction of port facilities along the water frontage of the island.

While the supreme court's decision apparently awards the jurisdiction over Government Island to Alameda, it is understood that a movement is on foot to transfer the island to Oakland. It is therefore impossible to state at the present writing whether the island and the northerly portion of Brooklyn Basin will be developed along the lines of the plans of Alameda or of Oakland.

IV. Existing Commerce

12. The total tonnage and value of commerce in Oakland Harbor for the calendar year 1920 to 1924 and the detailed items of the commerce for 1924 were given in the preliminary examination report, paragraphs 33 to 36. The corresponding figures for 1925 are given in the tables below:

13. *Total commerce in Oakland Harbor for 1925*

Year	Tons	Value	Ferry passengers
1925	2,764,966	$173,889,886	45,347,215

14. *Summary of commerce for 1925*

Classes of commodities	Foreign			
	Imports		Exports	
	Tons	Value	Tons	Value
Vegetable food products	91,200	$7,982,506	84,186	$14,492,132
Wood and paper	10,719	1,480,542	32,266	725,324
Ores, metals, and manufactures of	1,400	95,200	4,461	892,200
Nonmetallic minerals	42,146	638,592	16,694	127,040
Machinery and vehicles			1,630	1,630,000
Chemicals	4,650	186,000		
Unclassified	17,098	1,521,722	13,809	1,513,133
Total	167,213	11,904,562	153,046	19,379,829

Classes of commodities	Domestic				Total foreign and Domestic	
	Coastwise		Internal			
	Tons	Value	Tons	Value	Tons	Value
Animals and animal products			142	$38,340	142	$38,340
Vegetable food products	182,443	$37,284,306	153,989	21,336,145	511,818	81,095,089
Other vegetable products	1,458	257,700			1,458	257,700
Textiles	553	325,360			553	325,360
Wood and paper	489,923	11,661,442	7,234	169,066	540,142	14,036,374
Nonmetallic minerals	115,982	4,142,321	1,122,778	7,401,511	1,297,600	12,309,464
Ores, metals, and manufactures of	123,589	18,189,867	488	123,129	129,938	19,300,396
Machinery and vehicles	22,426	26,920,240	655	682,840	24,711	29,233,080
Chemicals	6,642	1,190,470	1,065	236,258	12,357	1,612,728
Unclassified	128,465	7,491,750	88,875	5,154,750	248,247	15,681,355
Total	1,071,481	107,463,456	1,375,226	35,142,039	2,766,966	173,889,886

General ferry, 318,415 short tons; 45,344,809 passengers; 1,502,344 automobiles; 5,263 motorcycles; 22,297 teams; 9,497 trailers and other vehicles, and 1,327 head of stock. Railroad car-ferry, 1,723,205 short tons.

15. *Vessel classification, 1925*

Classes of vessels	American (number)	Foreign (number)	Total number	Total net registered tonnage
Arrivals:				
Steamers	4,250	266	4,516	5,601,658
Motorships	533	10	543	145,642
Sailing vessels	50		50	91,436
Barges and lighters	6,495		6,495	1,364,229
Gasoline launches	13,311		13,311	271,939
All other	12		12	480
Total	24,651	276	24,927	7,475,384
Departures:				
Steamers	4,258	266	4,524	5,520,372
Motorships	533	10	543	145,642
Sailing vessels	50		50	91,436
Barges and lighters	6,482		6,482	1,364,229
Gasoline launches	13,301		13,301	271,919
All other	12		12	480
Total	24,636	276	24,912	7,394,078
Total arrivals and departures	49,287	552	49,839	14,869,462

16. *Trips and drafts of vessels, 1925*

TRIPS INBOUND

Draft (feet)	Steamers	Motor vessels	Sailing	Barges and lighters	Gasoline launches	All other
Over 30	9					
28 to 30	23	3				
26 to 28	34	2				
24 to 26	87	3				
22 to 24	157	5	1	1		
20 to 22	302	4	1			
18 to 20	755	2	6			
16 to 18	1,167	13	8	6		
14 to 16	742	4	11	10		
12 to 14	582	3	10	20		
10 to 12	114	133	11	26	4	4
8 to 10	28	84	2	129	865	8
6 to 8	372	287		2,260	5,730	
Less than 6	144			4,043	6,712	
Total	4,516	543	50	6,495	13,311	12

TRIPS OUTBOUND

Draft (feet)	Steamers	Motor vessels	Sailing	Barges and lighters	Gasoline launches	All other
Over 30	9					
28 to 30	27	3				
26 to 28	50	3				
24 to 26	94	3				
22 to 24	172	4	2	1		
20 to 22	324	5				
18 to 20	781		2			
16 to 18	1,119	15	8	6		
14 to 16	764	4	15	10		
12 to 14	609	3	7	20		
10 to 12	140	133	12	23	4	4
8 to 10	64	83	3	37	773	8
6 to 8	228	287	1	2,046	5,694	
Less than 6	143			4,339	6,830	
Total	4,524	543	50	6,482	13,301	12

17. The growth in commerce in Oakland Harbor is shown in the increased tonnage handled and in the greater number of deep-draft vessels making the harbor a port of call. The comparative figures of tonnage handled in 1924 and 1925 are as follows:

	1924	1925
Foreign:		
Import	143,763	167,213
Export	38,660	153,046
Domestic:		
Coastwise	595,759	1,071,481
Internal	1,438,345	1,375,226
Total	2,216,527	2,766,966

18. The comparative number of vessels of various drafts in the harbor in each of the two years is also of interest:

Trips and drafts of vessels, comparative

Draft (feet)	1924		1925	
	Inbound	Outbound	Inbound	Outbound
Over 30			9	9
28 to 30	2	2	26	30
26 to 28	6	5	36	53
24 to 26	20	17	90	97
22 to 24	98	95	164	179
20 to 22	214	199	307	329
18 to 20	584	560	763	783
16 to 18	580	542	1,194	1,148
Less than 16	10,733	10,730	22,338	22,284
Total	12,237	12,150	24,927	24,912

19. The full effect of the new terminal construction in the harbor is not reflected in the 1925 statistics, and it is anticipated that 1926 will again witness a pronounced increase in the harbor's commerce. After 1925, the commerce should continue to exhibit a steady growth, although probably not in proportion to the increase shown in 1925 and expected in 1926.

V. Improvements Desired by Local Interests

20. The desires of local interests for further improvements in Oakland Harbor are listed in paragraphs 28–32 of the preliminary examination report. Geographically, and in relation to type of commerce and size of vessels navigating the channels of the harbors, these requests are naturally grouped under three headings as follows:

(*a*) Channels across Goat Island Shoal and in inner harbor to and including Brooklyn Basin.

(*b*) Tidal canal and San Leandro Bay.

(*c*) Channel to the outer harbor (Key Route Basin).

VI. Channels Across Goat Island Shoal and in Inner Harbor to and Including Brooklyn Basin

21. The following requests, listed in paragraphs 29–32 of the preliminary examination report, pertain to the channel through the shoal southeast of Goat Island and in the inner harbor to the east end of Brooklyn Basin:

(*a*) The deepening of the present channel across Goat Island Shoal and to the end of the jetties to 35 feet at mean lower low water.

(*c*) The enlargement of the channel, from the end of the jetties to the westerly end of Government Island to 600 feet in width and 33 feet in depth.

(*g*) An adequate turning basin at the westerly end of Government Island, 33 feet deep.

(*i*) The maintenance, to whatever project depth may be adopted for the adjacent channel, of the area south of the channel and to within 75 feet of the pierhead line, between Harrison Street and Harbor Line Point No. 58, which latter is located on the south side of Brooklyn Basin, approximately on the prolongation of Nautilus Street, Alameda.

(*m*) The widening of the existing south channel in Brooklyn Basin to 1,000 feet in width.

EXISTING CHANNEL CONDITIONS

22. The present project channel depth is 30 feet from deep water in San Francisco Bay over the shoal southeast of Goat Island and in the inner harbor to Park Street. The channel deteriorates about 6 to 9 inches in depth per annum, and maintenance dredging to restore the project depth is necessary from time to time.

Within the harbor, the deterioration is in the form of soft mud, which can not be dredged by seagoing hopper dredge without the danger of seriously affecting the depths in the areas alongside the piers, due to the material put into suspension by the dredge pumps and passing overboard with the overflow from the dredge hoppers. Maintenance within the harbor has therefore habitually been done by contract with hydraulic pipe-line dredge. Economical maintenance by pipe-line dredge calls for dredging against a minimum bank about 5 feet in depth. It has been the practice, therefore, to allow the channel within the harbor to deteriorate to a controlling depth of 25 to 26 feet before redredging. This has not been a particular handicap to the harbor in the past, when the number of deep-draft vessels navigating the channel has been comparatively small, but with the large increase in the number of deep-draft vessels in the harbor the necessity of maintaining greater channel depth becomes urgent.

In the open bay the channel across the shoal near Goat Island and to the outer end of the jetties has been maintained by a seagoing hopper dredge, which can operate economically against a less depth of deterioration than is the case with a pipe-line dredge. Maintenance dredging has, therefore, been done at more frequent intervals and the project depth more closely maintained in the channel in the open bay than inside the harbor proper.

23. *Present depths.*—The present controlling depth at mean lower low water of the channel across Goat Island Shoal and to the outer end of the jetties is 29½ feet; thence 27 feet to a point in the tidal canal about 300 feet west of Park Street.

24. *Depths at terminals.*—The depths alongside the principal wharves in this portion of the harbor are:

	Feet
Western Pacific	32
C. & O. Lumber Co	21
Moore Dry Dock Co	30
Howard Terminal	30
Municipal quay wall and Market Street Pier	27, 29
Associated Oil Co	30
Standard Coal Co	25
Sunset Lumber Co	24
Alaska Basin (Encinal Terminal)	32
Fortmann Basin (Alaska Packers Association)	30
Oakland Elevator & Terminal Corporation	30
J. H. Baxter & Co	28
Clinton Basin	18

COMMERCE IN THE INNER HARBOR

25. The commerce in the inner harbor in 1925 is shown in the following table. In this table the quantities for the entire inner harbor, including Brooklyn Basin and the tidal canal, are shown in one column, and, in a parallel column, the figures pertaining to Brooklyn Basin and the tidal canal.

Summary of commerce 1925, inner harbor

	Entire inner harbor	Brooklyn Basin and tidal canal
	Tons	*Tons*
Foreign:		
Imports	147,743	4,678
Exports	72,493	35,960
Domestic coastwise:		
Receipts	641,134	286,926
Shipments	245,063	134,316
Internal:		
Receipts	1,173,290	141,943
Shipments	130,159	1,558
Total	2,409,882	605,381

The total for the inner harbor is approximately 200,000 tons in excess of the amount of freight handled over all the wharves in both the inner and outer harbors in 1924. It is expected that this amount will show a further substantial increase in 1926.

26. The following table gives a comparison for the years 1924 and 1925 of the number of deeper-draft vessels calling at the wharves in the entire inner harbor:

Draft	1924		1925	
	Inbound	Outbound	Inbound	Outbound
Over 30 feet	0	0	9	9
28–30 feet	2	2	26	30
26–28 feet	6	5	33	44
24–26 feet	20	17	79	77
Total over 24 feet	28	24	147	160

27. The following table gives the number and draft of vessels touching at wharves in Brooklyn Basin and upstream of that basin in 1925.

Draft (feet)	Inbound	Outbound	Draft (feet)	Inbound	Outbound
28 to 30	4	8	12 to 14	128	125
26 to 28	18	28	10 to 12	19	21
24 to 26	50	45	8 to 10	206	23
22 to 24	57	60	6 to 8	930	859
20 to 22	97	86	Under 6	751	1,007
18 to 20	232	236			
16 to 18	529	526	Total	3,251	3,254
14 to 16	230	230			

DISCUSSION OF REQUESTED IMPROVEMENTS

28. *Depth of channel.*—A project depth of 33 feet is thought to be none too great to permit the free and ready navigation of deep-draft ocean-going freighters in the harbor. The commercial statistics for 1925 show that an average of three vessels per month drawing more than 28 feet of water entered and left the harbor. These vessels can now safely navigate the harbor only at higher stages of the tide, and have repeatedly been forced to wait for favorable tidal condition, before proceeding to Oakland Harbor. A depth of 33 feet at mean lower low water will be reduced to from 31.5 to 32 feet at times when the tidal level is below the datum plane and will be reduced, also, when, in the interest of economy of maintenance, the channel is allowed to deteriorate to less than the project depth.

Large, deep-draft vessels, which operate on a close-time schedule, can not, without considerable loss of time and money, wait for favorable tide conditions to enter an important harbor. A project depth of 33 feet in the principal channels of the harbor, redredged whenever the controlling depth has deteriorated to 30 feet, would provide a channel deep enough for practically any vessel which would enter the harbor and seems to be justified by the number and draft of vessels now using this channel and those which are to be expected to do so in the future.

29. *Depth across Goat Island Shoal.*—There is not thought to be justification, however, for a greater depth in the channel across Goat Island Shoal than in the channel inside the harbor. Wave action in the open bay is not great enough to cause large vessels to pitch to the extent of requiring a greater channel depth for safe navigation. Moreover, as stated in paragraph 23 above, the project depth is habitually more closely maintained in the channel in the open bay than within the harbor proper.

30. *Widths.*—The widths of the present project channel are 800 feet across the shoal near Goat Island, narrowing to 600 feet at the outer end of the jetties; thence 600 feet to Webster Street; thence 500 feet to the east end of Brooklyn Basin, with local widenings in front of the municipal quay wall and between Harrison Street and Brooklyn Basin, the latter being provided for by authority to maintain an area originally dredged by local interests. Local interests now request a widening between Webster Street and the west end of Government Island to 600 feet, a turning basin at the west end of the island, a

channel 1,000 feet wide along the balance of Brooklyn Basin, and the extension of the authority for maintenance of the area south of the channel, from Harrison Street eastward to Brooklyn Basin (at harbor line point No. 58).

31. *Widening between Webster Street and Government Island.*—An increase in channel width from 500 feet to 600 feet between Webster Street and the west end of Government Island requires, except for a comparatively short distance near Webster and Harrison Streets, the taking over only of a strip 100 feet wide already dredged 30 feet deep by private interests. If deepened to a project depth of 33 feet, along with the present 500-foot channel, this would add but little to the total cost of deepening the channel in the harbor. Deep-draft vessels in large numbers navigate the channel upstream as far as this increased channel width is requested. It is logical to provide a uniform width and depth of channel throughout the full distance from the entrance of the harbor to the upper deep-water terminals.

32. *Extension of area maintained by Federal Government.*—The existing project authorizes the maintenance to 30 feet of the area south of the channel and to within 75 feet of the pierhead line between Harrison Street and Brooklyn Basin. Local interests now request that this authorization be extended eastward about 2,500 feet and be changed to provide the maintenance of the entire area to the project depth adopted for the adjoining channel. The area in Brooklyn Basin in which maintenance is now requested has recently been dredged to 30 feet at the expense of private interests. This dredging has resulted in straightening the through channel in this locality and, with the adjoining Government channel, has provided a local widening to a maximum channel width at one point of 1,100 feet. Both results have been very beneficial to general navigation, which uses this area both as a navigation channel and as a turning basin; the maintenance of the channel depth in this area by the Federal Government would insure the permanence of this benefit. The maintenance of this area to 33 feet should, however, be contingent upon local interests first dredging the additional depth of 3 feet.

33. *Turning basin.*—The local widening described above does not extend over a sufficient length to make in itself as large a turning basin as will be necessary at the west end of Brooklyn Basin when the frontage in the basin is further developed along the lines now planned. The dimensions of the turning basin can be increased, without conflicting with any of the present plans for the development of the frontage, by dredging a triangular strip, about 2,700 feet long and with a maximum width of about 300 feet, located at the western end of Brooklyn Basin and just north of the north line of the Government south channel of Brooklyn Basin. The widening would extend to within about 75 feet of the outer line of the mole piers planned to be built by the city of Oakland. The effect of such a triangular strip, together with the channel proper and the area south of the channel dredged by private interests, would be to create a local widening of the through channel to widths of from 1,000 to 1,100 feet for a length of about 1,800 feet, giving in effect a turning basin which would be adequate for the needs of shipping at this locality.

There is at present a turning basin at the east end of Brooklyn Basin, which, together with the channel at that point, provides a triangular-shaped area with a base about 1,500 feet long and with a

maximum width of 1,000 feet. This turning basin was provided to accommodate vessels from the wharves and shipyards at the east end of Brooklyn Basin, and in the tidal canal west of Park Street, and is as large as is feasible at that locality. It is too small an area, however, for large vessels to turn in unassisted and too far away to be of benefit to vessels from the terminals and wharves between Webster Street and the west end of Brooklyn Basin. It is to accommodate the large number of vessels from this locality that a turning basin at the west end of Brooklyn Basin is desirable.

34. *Channel in Brooklyn Basin.*—To continue this widening eastward, so as to make a width of 1,000 feet throughout the south channel in Brooklyn Basin, would require the removal of a part of Government Island, and would conflict with the plans of the city of Alameda for the development of the island. While a certain benefit to navigation, due to the increased channel width, would result, the benefit would not, it is thought, justify at this time the expenditure involved. The existing project for the south channel in Brooklyn Basin calls for 30-foot depth and 500-foot width, with a turning basin at the eastern end. The channel width is sufficient for the present commerce and the probable increase in the next few years. If it turns out that the basin is to be developed along the lines planned by the city of Oakland, the construction of the various mole piers will include the dredging of the area between the piers and the Government channel, thus widening the channel as an incident of such construction.

NORTH CHANNEL IN BROOKLYN BASIN

35. The existing project provides for a channel 300 feet wide and 25 feet deep along the north side of Brooklyn Basin, between Government Island and the Oakland shore. The dredging of this channel, under a former project, was completed in 1916. No maintenance work has been done in the channel since, but deterioration has reduced the controlling depth to about 11 feet. Redredging is now required to care for the needs of commerce. The city has two wharves at the head of this channel, which handled a total of 93,514 tons of freight, principally lumber and petroleum products, in 1925. There are four other minor wharves and two boat-repair plants with marine ways along the channel. The aggregate investment in wharves and other marine structures along the channel is fairly large.

36. The city of Oakland's plans for pier construction in Brooklyn Basin contemplate the eventual abandonment of the north channel, while Alameda's plan calls for the ultimate enlargement of that channel approximately along its present alignment. Should the basin be developed in accordance with the Oakland plan, the first pier will be built at the extreme west end of the basin. While the shore end of this pier would obstruct the present north channel, the dredging of the slip along the eastern side of the pier would provide a temporary connecting waterway between the north and south channels in the basin, so that access to wharves on the north channel upstream of the pier would not be blocked. The north channel should therefore remain a waterway for general navigation for a long time to come, and such minimum maintenance of this channel as is necessary within the limitations of the existing project appears to be justified

until such time as definite plans are matured which require the abandonment of the north channel as a navigable waterway.

37. *Sewer discharge in north channel.*—There are seven sewers belonging to the city of Oakland discharging into the north channel; the aggregate discharge from these sewers is large. Deterioration in the channel in recent years has been due in part to the discharge from these sewers, in part to the overflow from the spillway on Government Island, during discharge of dredge spoils on the island, and in part to ordinary natural causes. The present contract for dredging in the south channel in Brooklyn Basin and in the tidal canal will probably be the last in which dumping is done on Government Island. Deterioration in the north channel in the future will therefore be due only to ordinary natural causes and to the sewers; and it is thought that the sewers will be responsible for about one-half the total deterioration in the channel. It is believed, therefore, that any new project for Oakland Harbor should provide that future maintenance in the north channel of Brooklyn Basin be contingent upon the removal by the city of Oakland of all sewers emptying into the north channel, or, in lieu of such removal, upon the contribution by the city or other local interests of one-half the cost of maintenance of such north channel.

ESTIMATES OF COST—GOAT ISLAND SHOAL TO BROOKLYN BASIN

38. The estimated costs of various items of improvement in the channels across Goat Island Shoal and in the inner harbor as far as the tidal canal are given below. These estimates are tabulated in three columns as follows: The first column gives the total estimated cost of each item of improvement under the new project, based on present depths and completion of current contract work; the next column gives the estimated cost of restoring the present channels to project depth under the existing project; and the last column gives the difference, or the net increase, of cost of the improvement above the cost for the present project:

	I Total estimated cost of new project	II Estimated cost under present project	III Increased cost due to new project
a. Deepening the existing channel across Goat Island Shoal and to the western end of the entrance jetties of the inner harbor to 33 feet at mean lower low water, with 1 foot overdepth, dredged by seagoing hopper dredge and hired labor, 716,400 cubic yards, at 15 cents per cubic yard	$107,460	$25,200	
Contingencies, inspections, and office expenses	10,700	2,550	
Total	118,160	27,750	$90,410
Maintenance per annum	14,300	11,300	3,000
a'. Deepening above channel to 35 feet with 1 foot overdepth, 1,112,000 cubic yards, at 15 cents	166,800	25,200	
Contingencies, inspections, and office expenses	16,700	2,550	
Total	183,500	27,750	155,750
Maintenance per annum	18,000	11,300	6,700
b. Deepening the existing channel in the inner harbor from the outer end of the jetties to Webster Street to 33 feet at mean lower low water, with 2 feet overdepth, work to be done by pipe-line dredge under contract, 2,813,000 cubic yards, at 22 cents per cubic yard	618,860	158,064	
Contingencies, inspection, and office expenses	49,500	15,806	
Total	668,360	173,870	494,490
Maintenance per annum	31,000	27,500	3,500

	I Total estimated cost of new project	II Estimated cost under present project	III Increased cost due to new project
c. Widening the existing channel from Webster Street to the western end of Brooklyn Basin to 600 feet, thence narrowing to 500 feet at a point opposite harbor line point No. 48 in Brooklyn Basin and deepening this length of channel to 33 feet at mean lower low water, with 2 feet overdepth, to be done by pipe-line dredge under contract, 998,000 cubic yards, at 20 cents per cubic yard	$199,600	$36,400	----------
Contingencies, inspection, and office expenses	16,000	3,600	----------
Total	215,600	40,000	$175,600
Maintenance per annum	20,000	14,500	5,500
d. Dredging a triangular strip, about 2,700 feet long and 300 feet wide, along the north side of the existing south channel of Brooklyn Basin, at its west end, to 33 feet deep at mean lower low water, with 2 feet overdepth, to be done by pipe-line dredge under contract, 493,000 cubic yards, at 20 cents per cubic yard	98,600	None.	----------
Contingencies, inspection and office expenses	8,000	----------	----------
Total	106,600	----------	106,600
Maintenance per annum	2,000	----------	2,000
e. Maintenance to within 75 feet of the pierhead line of the area south of the Government channel and lying between Harrison Street prolonged and harbor line point No. 58 in Brooklyn Basin per annum	12,000	8,000	4,000
(The above item contemplates that the Federal Government shall maintain this area to 30 feet, the depth already dredged at the cost of private interests, that the deepening to 33 feet shall be done at the expense of private interests, and that after having been deepened to 33 feet the area shall be maintained to this depth by the Federal Government.)			
f. Widening the existing south channel to 1,000 feet in width, 30 feet deep with 1 foot overdepth (including item *d* above), to be done by pipe-line dredge under contract, 2,758,000 cubic yards at 26 cents per cubic yard	717,080	None	----------
Contingencies, inspections, and office expenses	71,700	----------	----------
Total	788,780	----------	788,780
Maintenance per annum	16,000	9,500	6,500
g. Maintenance of existing project north channel in Brooklyn Basin, per annum	10,700	10,700	None
h. Maintenance of existing south channel in Brooklyn Basin, upstream of harbor line point No. 58, and of the turning basin at east end of Brooklyn Basin and of the tidal canal to Park Street, per annum	8,000	8,000	None
i. Total for Goat Island Shoal and inner harbor, including item *a* (33 feet) and omitting item *f*	1,108,720	241,620	867,100
Maintenance per annum	98,000	80,000	18,000

39. The material to be dredged in the channels in the bay is suitable for seagoing hopper dredge.

A large portion of the material in the channels between the entrance to the inner harbor and Brooklyn Basin, however, below the depth already dredged, is stiff, sandy clay and unsuitable for dredging by seagoing hopper dredge.

The material at the west end of Brooklyn Basin and the channel near by is practically all mud, except that clays are encountered at depths around 30 feet. But this is not a suitable locality for dredging by seagoing hopper dredge, because the overflow from the dredge, while pumping, would carry a large amount of mud in suspension, which, carried throughout the harbor by tidal currents, would cause serious deterioration in the channels and the slips and berths alongside the piers and wharves in the harbor. A seagoing hopper dredge such as the *San Pablo*, with facilities for discharging overboard into a pipe line, could probably dredge the mud in the west end of Brook-

lyn Basin for about 15 cents per cubic yard, depositing the dredged material through a pipe line on the mud flats south of Alameda Mole. However, the underlying clays that would have to be dredged to make a depth of 33 feet would add materially to this figure, and it is doubtful if the work in Brooklyn Basin could be done as cheaply by seagoing hopper dredge as by pipe-line dredge when done in connection with other dredging in the adjoining channel. Moreover, the existing depth over a portion of the area is insufficient for a seagoing hopper dredge.

The character of materials, the present depth of channel, and the conditions of exposure, traffic, and disposal of dredged materials thus make a seagoing hopper dredge more suitable for dredging the channels in the open bay and a pipe-line dredge more suitable for the work in the channels inside the harbor. The estimates for new work were made accordingly.

40. The estimated cost of annual maintenance of the various portions of the existing project, as stated in paragraph 38 above, are higher than the present approved estimated costs of maintaining the project channel. The differences are due in part to more complete information as to the amount of deterioration in the channels, and in part to higher unit prices, based on experience and taking into consideration the greater length of discharge line that will be required in the future.

41. *Dumping grounds.*—Adequate dumping grounds for the dredge spoils from the proposed channels in the inner harbor exist at the tide flats north of the north training wall at the entrance of Oakland Harbor, and south of the Alameda Mole, or south training wall. The former area is generally used for the disposal of dredge spoils from the north half of the channel along the length of the training wall. Dredge spoils from the balance of the channel would be placed on the tract south of Alameda Mole.

SAVINGS TO BE EXPECTED FROM PROPOSED IMPROVEMENTS

42. The argument in favor of further channel improvement in Oakland inner harbor is based largely on the inadequacy of the existing channels for the commerce now carried. Of the imports and exports and the coastwise receipts and shipments in 1925, an estimated amount of about 544,700 tons was miscellaneous freight carried in deep-draft vessels and consigned to or originating from industries in or near Oakland. The saving effected on this freight is due to the smaller rail-switching charge between wharf and industry or warehouse on the Oakland side when cargo is unloaded from ship at Oakland Harbor instead of at San Francisco. In either case, the handling and unloading costs are practically the same. The rail charges on all freight between the various wharves in San Francisco and industries or warehouses in Oakland are 70 cents per ton, with a minimum charge of $15 per car; the switching charges between wharves and industries in Oakland vary according to the location of the wharf and industry, but the usual charge is 34 cents per ton, with a minimum charge of $7.20 per car. The difference is 36 cents per ton in favor of the wharves in Oakland Harbor. Crediting the 544,700 tons of deep-draft commerce described above with a saving of 36 cents per ton makes a total saving on this commerce of $196,092

per annum, based on the 1925 statistics, not all of which, however, is properly creditable to larger-draft vessels. The draft of vessels carrying the above freight ranges from 22 to 30 feet or more. The amount of the freight carried in vessels of draft greater than 26 or 28 feet can not be stated separately, but the number of such vessels has greatly increased in the past year, as shown in paragraph 18 above, and will probably continue to increase rapidly for some time to come.

43. In addition to the above an increasing amount of export and coastwise tonnage is brought by rail to Oakland and there transferred to ship. The rail freight charges from interior points to Oakland are in general the same as to San Francisco, and the railroad which gets the line haul absorbs the switching charges at either terminal. There is, however, an economic saving to the railways in favor of the port of Oakland due to the shorter railroad haul to Oakland on the one hand and the belt-line railroad charges in San Francisco on the other. The gross amount of this saving is not known, but Oakland is making a determined effort to build up a large volume of in-transit commerce and, as additional channel and terminal facilities are provided, a large increase in this class of commerce can be expected.

44. As stated in paragraph 28 above, the deep-draft vessels calling at the harbor are now handicapped by lack of depth in the channels and must often wait for favorable tidal conditions before proceeding to Oakland Harbor. The removal of this handicap and the construction of the additional port facilities will stimulate the growth of deep-draft commerce, both in-transit and local, resulting in an increase in the amount of savings pertaining to this commerce.

45. An analysis of the savings due to channel improvements already made by the Federal Government in Oakland Harbor and of the financial returns which these savings represent on the total cost of the channel improvements, including the further improvements recommended in this report, is submitted in paragraph 70 hereafter.

VII. Tidal Canal and San Leandro Bay

46. In the tidal canal and San Leandro Bay local interests have requested the following additional improvements, as stated in paragraphs 29–30, inclusive, of the preliminary examination report:

d. The deepening of the existing channel in the tidal canal above the Park Street Bridge to 25 feet.

e. The acquirement of an additional 200-foot width of right of way bordering the tidal canal, in order to facilitate its future deepening to 30 feet over an adequate width.

f. The reconstruction of bridges over the tidal canal, with foundations of adequate depth, and with adequate clear openings.

j. The dredging of a channel from the tidal canal up East Creek Slough.

k. The construction of a channel along the Alameda shore of San Leandro Bay, from the tidal canal to Bay Farm Island Bridge.

l. The construction of a turning basin of tidal canal project depths between pierhead lines at the entrance to the tidal canal at San Leandro Bay.

SAN LEANDRO BAY

47. The lands bordering San Leandro Bay are potentially very valuable for sites for industrial plants. These lands, some 5,000 acres or more in extent, are mostly unreclaimed marsh lands of moderate present value. Reclamation, in connection with the dredging of channels in San Leandro Bay, would be comparatively inexpensive, making it possible in this locality to furnish sites for industries requiring large ground areas and water-front facilities at a much less cost than in the more congested portions of the harbor. Both the Southern Pacific and Western Pacific Railroads have main-line tracks close to this territory and the installation of spur tracks to serve industries here would be a simple matter. This unreclaimed area around San Leandro Bay is immediately adjacent to the important industrial area of the Melrose and Elmhurst districts of Oakland, and is therefore in direct line for reclamation and use as the other available industrial areas become occupied. Moreover, this close proximity should be reflected in lesser railroad switching charges from terminals in San Leandro Bay to the already built-up adjacent industrial area, as compared to the charges from other terminals in Oakland Harbor.

48. Various plans for the reclamation of portions of the San Leandro Bay territory have been studied and proposed by parties interested in this matter, but up to now no definite plan carrying an assurance of a waterborne commerce has been reported to this office. It is believed, however, that the near future will witness the beginning of the active development of the lands adjoining San Leandro Bay.

49. Dredge spoils from channels dredged in San Leandro Bay can be used for the reclamation of the area adjacent to the channels. Any plan for channel improvements in the bay should therefore be carried out largely, if not wholly, at the expense of private interests. It is probable that, after channels have been made and the adjacent lands reclaimed, a large commerce will develop in San Leandro Bay. In this event, it will be proper for the United States to consider taking over the maintenance or the further improvement of such channels, but it is believed that conditions do not warrant the dredging by the Federal Government of channels in San Leandro Bay at the present time.

TIDAL CANAL

50. *Present conditions.*—The existing project for the tidal canal east of Park Street provides for a channel 300 feet wide and 18 feet deep at mean lower low water. The dredging to project dimensions was completed in 1920. There is very little deterioration in the canal, the present controlling depth being 18 feet, although no maintenance dredging has been done. The depths alongside the lumber wharves in the canal are 18 feet except at the wharf of the Pacific Pipe & Tank Co., where the depth is 20 feet.

51. *Commerce.*—The existing commerce in the tidal canal above Park Street consists principally of lumber and building materials, and amounts to about 200,000 tons per annum, divided about equally between the two classes. Lumber is brought in by coastwise steamers, which when fully loaded would draw as much as 22 or 23 feet of

water. The present controlling depth in the tidal canal is 18 feet. Lumber carriers can not navigate in the canal except at higher stages of the tide or when only lightly loaded, and, therefore, when loading at lumber ports along the North Pacific coast must place lumber destined for wharves in the tidal canal at the bottom of the hold, in order that the balance of the cargo may be unloaded before calling at the wharves in the canal. These vessels, when loading, take part loads at various mills. It often happens that an order of lumber for a wharf in the tidal canal will be waiting for shipment at the last mill touched at. Because this lumber would have to be placed on top of the balance of the load and therefore unloaded first of all the cargo, when the vessel is drawing full draft of water, the shipment has to be refused by the vessel or, if accepted, it must be unloaded in Oakland Harbor onto a barge and barged to destination in the canal.

The inadequacy of the depths of the tidal canal for the present-day coastwise lumber carriers is shown by the following table, in which the number of inbound lumber carriers of various drafts touching at the wharves in the tidal canal is tabulated in one column and, in a parallel column, the number of such vessels touching at two typical lumber wharves in the inner harbor where the depth of water is not a hindrance. It will be noted in this table that, while the total number of steamers in the tidal canal is greater than the number touching at the two wharves in the inner harbor, the number of deeper-draft vessels at the latter wharves is far in excess of such vessels in the tidal canal. The table also shows that vessels navigating the tidal canal are restricted as to draft by the project depth of this waterway.

Inbound coastwise lumber steamers calling at wharves in 1925

Draft (feet)	Tidal canal above Park Street	Two typical wharves in inner harbor below Park Street	Draft (feet)	Tidal canal above Park Street	Two typical wharves in inner harbor below Park Street
22 to 24	1	25	12 to 14	8	31
20 to 22	33	64	10 to 12	0	8
18 to 20	121	107			
16 to 18	339	78	Total	525	332
14 to 16	23	19			

52. *Development along the tidal canal.*—Along the tidal canal east of Park Street there is a total of about 13,800 feet of frontage, of which about 2,850 feet is occupied by wharves or other industrial structures, 2,800 feet is residential, and 8,150 feet is unoccupied. Of the occupied frontage, about 500 feet of wharf represents new construction in the last year and a half. The tidal canal, being close to a rapidly growing portion of Oakland and Alameda, is a particularly desirable location for lumber and building material wharves.

The tidal canal is also the entrance waterway to San Leandro Bay, connecting the bay with Brooklyn Basin and thus with San Francisco Bay and the sea. The potential value of San Leandro Bay and the adjacent lands has been described in paragraphs 47 and 49 above. Although it is believed that the dredging of channels in San Leandro Bay at the expense of the Federal Government is not warranted at

this time, there is justification for encouraging the ultimate development of San Leandro Bay by deepening the entrance channel; i. e., tidal canal to such depth that some portion of ocean-going vessels may, with the aid of the tide, reach channels which private interests may dredge in the bay.

53. *Benefits to accrue from increased depth in the tidal canal.*—A channel 25 feet deep in the tidal canal would enable the coastwise steamers, now handicapped by lack of depth of water, to navigate freely in the canal, stimulate the construction of wharves and industries along its banks, and aid and encourage the development of San Leandro Bay. The immediate result of a deeper channel in the tidal canal would probably be the establishment of new industries and the construction of new wharves along the banks of the canal and a large increase in the amount of lumber brought to the wharves on this waterway. It is thought that the increase in annual commerce due to deeper water would amount to more than 100,000 tons of lumber within three or four years after the deeper channel was completed. There are not at present lumber wharves in the easterly part of the inner harbor of sufficient capacity to handle the lumber consigned to the retail yards in the Fruitvale, Melrose, and Elmhurst districts, and as a consequence, lumber consigned to yards in these districts is now often landed at the municipal quay wall at Grove Street or at the Parr Terminal in the outer harbor. Deeper water in the tidal canal will permit this lumber to be landed at wharves on the canal, several miles nearer its destination than where it is now landed. The resulting savings would be due to the shorter haul from wharf to destination. The amount of saving due to this shorter haul would probably be about 35 cents per ton, or a total on 100,000 tons of increased commerce of $35,000 per annum. A much greater benefit, however, would result from the development of San Leandro Bay, by private interests, particularly along East Creek and East Creek Slough, which would probably follow the making of a 25-foot deep channel in the canal.

54. *Additional right of way.*—The present right of way for the tidal canal is 400 feet in width, except at the two ends, where the sides of the canal flare out to meet the shores of Brooklyn Basin on the west end and San Leandro Bay on the east. This width is sufficient for the ultimate dredging of a channel 350 feet wide and 30 feet deep in the canal. Additional right of way through the industrial district in the two cities would be exceedingly high in cost, would encroach upon the depth, already too small in some places, of industrial lands between the canal and the adjacent established streets and would necessitate the alteration or abandonment of industries already established along the banks of the canal. In addition, a deep channel in the canal of greater width than is possible between the present banks would require the dredging away of a high bank on shore, in addition to dredging in the present channel, making the quantity to be dredged, per linear foot of channel, excessive.

It is possible that the traffic to San Leandro Bay may ultimately require greater channel dimensions than are possible to obtain in the present right of way of the tidal canal. In this event, a channel south of Alameda, connecting San Leandro Bay with deep water in San Francisco Bay, dredged in connection with the reclamation of the tide lands bordering Alameda, would probably be perferable to

widening the tidal canal. In planning such a channel full study would have to be given to the effect of diversion of flow from the existing project channels of the inner harbor. It is not the policy of the United States to purchase right of way for channel improvements, but in considering the justification of an improvement, the total cost, whether it be borne by the United States alone or by local interests and the United States jointly, must be considered. In the light of the feasibility of another connection between San Leandro Bay and San Francisco Bay it is not believed that local interests should be encouraged to purchase additional right of way along the tidal canal with the implied promise that the United States will later dredge therein a wider deep-water channel than is possible in the present right of way.

55. *Turning basin.*—The deepening of the present channel in the tidal canal, under the conditions of local contribution discussed in paragraph 57, is considered justified for the reasons stated in paragraph 53 above, but this deepening is all that it is believed the United States should undertake to do in this waterway at the present time. A turning basin at the San Leandro Bay end of the canal would be of benefit to ships calling at wharves immediately adjacent to the turning basin, but vessels at other wharves along the canal would have to pass through one or two bridges to reach the turning basin and then, having turned, would have to pass through the same bridges again in going out through the canal to San Francisco Bay. The value of the tidal canal is threefold: As a waterway along whose banks are located wharves and industries served by vessels of moderate size, such as coastwise lumber carriers and building materials barges; as a link in the connecting channels between the potentially valuable San Leandro Bay territory and other waterways and the sea; and as a contributor to the volume of ebb-tide waters which assist in maintaining the Oakland Harbor channels between the canal and San Francisco Bay. The industries and terminals for which this waterway width is peculiarly suitable are served by vessels which can be turned unassisted in the width of channel now available. Larger vessels can be turned around in the turning basin at the junction of the tidal canal and Brooklyn Basin.

56. *Bridges.*—The deepening of the tidal canal will necessitate the alteration of the three drawbridges which cross over it. The bottoms of the foundations of the center piers of these bridges are only 19 feet below mean lower low water. Moreover, these draw openings are narrow, the clearances, when closed, are small, and the bridges are very slow in operation. The district engineer, on February 11, 1926, reported to the Chief of Engineers that, in his opinion, these bridges constituted an unreasonable obstruction to navigation and, by authority of the Secretary of War, a public hearing on the subject of their alteration will be held on May 5, 1926. The bridges are under the control of the Board of Supervisors of Alameda County, which, it has been understood, must, under the county's agreement with the War Department, bear the expense of altering the bridges when alteration is found necessary. The adoption of any increased project for the tidal canal should be contingent upon the suitable alteration of these three bridges, at the expense of local interests, before the improvement is undertaken; and, in order to safeguard the position of the United States with respect to its past

expenditures for improving the navigation of the tidal canal, it is also considered desirable to make the adoption of any new project for Oakland Harbor contingent upon the giving of definite assurances to the United States that the county of Alameda or other local governing body satisfactory to the Secretary of War will continue to maintain and operate these bridges over the tidal canal, free of cost to the United States, and to alter or replace them, to the satisfaction of the Chief of Engineers and the Secretary of War, when, in the opinion of the Secretary of War, such alteration or replacement is necessary to render navigation in the tidal canal and through said bridges reasonably free, easy, and unobstructed.

57. *Reclamation in conjunction with deepening the tidal canal.*—The material to be dredged in deepening the channel, being clay, sand, and gravel, would be very desirable for reclamation of marshlands adjacent to San Leandro Bay. For this purpose, these dredge spoils are believed to be worth 10 cents per cubic yard, an estimated total of $53,330. Local interests should be required to furnish dumping grounds and contribute this amount toward this improvement, being given the dredge spoils in payment.

58. The following estimates are submitted:

Estimates of cost, tidal canal and San Leandro Bay

(*a*) Deepening the existing channel in the tidal canal from Park Street to San Leandro Bay to 25 feet, 275 feet wide, with 1 foot overdepth, to be dredged by contract; 533,300 cubic yards, at 50 cents per cubic yard	$266,650
Contingencies, inspections, office expenses, etc	18,600
Total	285,250
Maintenance per annum	1,000
(*b*) Widen the channel in the tidal canal at San Leandro Bay to make a turning basin 1,000 feet long, about 600 feet wide, and 25 feet deep, with 1 foot overdepth, to be dredged by contract; 265,000 cubic yards, at 30 cents per cubic yard	79,500
Contingencies, inspections, office expenses, etc	5,500
Total	85,000
Maintenance per annum	2,000
(*c*) Dredging a channel from the tidal canal up East Creek Slough, 250 feet wide, 25 feet deep, with 1 foot overdepth, to be done by contract; 1,320,400 cubic yards, at 20 cents per cubic yard	264,080
Contingencies, inspections, office expenses, etc	21,120
Total	285,200
Maintenance per annum	3,500
(*d*) Construct a channel along the Alameda shore of San Leandro Bay from the tidal canal to Bay Farm Island Bridge, 250 feet wide, 25 feet deep, with 1 foot overdepth, to be dredged by contract; 1,187,400 cubic yards, at 15 cents per cubic yard	178,110
Contingencies, inspections, office expenses, etc	17,800
Total	195,910
Maintenance per annum	5,000

VIII. Channel to Outer Harbor (Key Route Basin)

59. *Desires of local interests.*—The existing approach channel to the Key Route Basin is 250 feet wide and 30 feet deep. This channel has been dredged and maintained by the city of Oakland without assistance from the Federal Government. As stated in paragraph 59 of the preliminary examination report, this channel is narrow, is crosswise to the tidal currents, and is far from a direct route between deep water in San Francisco Bay and the wharves in the basin. The city now requests that the Federal Government replace the present channel with a channel 800 feet wide and 35 feet deep, in a direct line from the east end of the channel across the shoal southeast of Goat Island to the basin, just clearing the extreme northwest point of the ferry slips at Oakland Mole.

60. *Terminals.*—There are at present only two port terminals in the Key Route Basin—the Parr Terminals, operating as a commercial terminal open to all shippers and all vessels at fixed charges, and the wharf of the Albers Milling Co., over which are handled feed, grain products, and molasses, principally on account of the owner. Both of these terminals have a depth of 30 feet alongside the wharves. As stated in paragraphs 8 and 9 above, the city plans the construction in the near future of an apron wharf 900 feet long, with a transit shed along one-half its length, along the bulkhead north of the Parr Terminal, and private interests plan to construct a warehouse and additional transit sheds on existing wharves in the basin.

61. *Railroad facilities.*—The wharves in the Key Route Basin are served by spur track from the Southern Pacific lines on Oakland Mole. The switching rates from these wharves to industries at various points within the switching limits are the same as from the wharves in the inner harbor west of Webster Street. The extension of the industrial tracks of the Santa Fe Railroad and of the Key system (a local electric suburban line with freight spurs to some industries) to the wharves in the Key Route Basin can be more easily accomplished than to many of the wharves in the inner harbor. It is understood that the city expects to have rail connections with these two railroads as well as with the Southern Pacific Railroad from the wharf to be built in this basin.

62. *Ferry traffic.*—During the greater part of the daytime seven passenger and automobile ferries per hour travel each way between Oakland Mole and San Francisco. The proposed channel is practically in the line of this ferry traffic and passes close to the ferry slips at Oakland Mole. There is a certain amount of danger of collision between ferries and vessels in the through channel near Oakland Mole in foggy weather. At such times, however, the number of ferries operating is lessened and large ocean-going vessels usually remain tied to the wharves. The potential danger of collisions due to the proximity of the channel to Oakland Mole is therefore thought to be small.

63. *Cables.*—There are about 13 submerged telegraph and telephone cables from Oakland Mole to San Francisco which cross the proposed channel. These cables would have to be moved whenever dredging was done in this part of the channel, the cost of moving

being borne by the owners. It is possible that the companies owning the cables would permanently relocate them rather than face the probable expense of taking care of them whenever dredging work should necessitate their temporary removal.

64. *Commerce.*—The total commerce handled over the wharves in the Key Route Basin in 1925 was 240,644 tons. Of the deeper-draft vessels, the following number are reported to have called at these wharves in 1925:

Draft	Inbound	Outbound
26–28 feet	3	3
24–26 feet	7	7
22–24 feet	15	15

65. *Estimates.*—The material below a depth of about 26 feet is firm clay and unsuitable for inexpensive dredging by seagoing hopper dredge. The estimates therefore, contemplate doing the work by pipe-line dredge. Maintenance work would probably be done more economically by sea-going hopper dredge. Overdepth is estimated at 1 foot, to cover the mechanical inaccuracies of dredging and insure full project depth being attained. The estimated cost of channels of various widths and depths from the east end of the channel across the shoal southeast of Goat Island to the pierhead line at the southerly end of the Key Route Basin is as follows:

Channel to Key Route Basin, with a 1 foot overdepth

(a) 35 FEET DEEP

Width	Quantity of material	Unit price	Dredging cost	Contingencies, etc.	Total estimated cost	Annual maintenance
Feet	*Cubic yards*	*Cents*				
500	1,397,600	21	$293,496	$29,300	$322,796	$8,000
600	1,852,000	20	370,400	37,000	407,400	9,500
800	2,534,900	19	481,631	48,200	529,831	13,000

(b) 33 FEET DEEP

500	1,222,715	21	$256,770	$25,700	$282,470	$7,500
600	1,580,683	20	316,137	31,600	347,737	9,000
800	2,127,050	19	404,140	40,400	444,540	12,250

(c) 30 FEET DEEP

500	1,036,000	21	$217,560	$21,750	$239,310	$7,000
600	1,292,000	20	258,400	25,800	284,200	8,500
800	1,791,370	19	340,360	34,000	374,360	11,500

66. *Dumping grounds.*—There are three possible sites for dumping grounds for the disposal of dredge spoils from the channel under discussion—the area north of the north training wall at the entrance to the inner harbor, the shoal area south of and close to the Key system pier, and the area north of Oakland Mole and between the original shore line and the existing filled area adjacent to the bulkhead line in the Key Route Basin.

The first-mentioned dumping ground would require a pipe line of a maximum length of 8,000 feet and an average length of about 7,500 feet to reach the dumping ground, and would probably necessitate a submerged pipe line across the channel, which the Southern Pacific Co. has dredged from deep water to three wharves along the south side of Oakland Mole. The nearest dumping ground is the area adjacent to the Key system pier. The average length of pipe line necessary to reach this area would be about 5,500 feet, with an extreme length of 8,000 feet. A submerged pipe line across the existing channel into the Key Route Basin would be necessary. On account of the depth of water at present on this proposed dumping ground the cost of a levee or bulkhead to retain the dredged spoils would be considerable.

A portion of the material to be dredged is stiff clay, which requires a relatively large amount of power to force the material through the discharge pipe. Either of the above dumping grounds would therefore necessitate the use of a booster pump in the discharge line. Neither area after filling would be of sufficient value immediately or in the near future to warrant paying for the dredged material dumped on the ground.

The third dumping ground, the area north of Oakland Mole and close to the former shore line, is owned by the Southern Pacific Co. This dumping ground is the farthest of all three discussed, the average length of pipe line necessary being about 9,000 feet with an extreme length of about 12,000 feet. No submerged line would be necessary. The company is interested in having this property reclaimed and has an informal agreement with the city of Oakland whereby the city is paid for dredged material placed upon this property. The price is understood to be 7 cents per cubic yard. The officials of the railroad company state verbally that the company would probably be willing to pay for additional material to be placed on its property.

67. *Necessity for improvement.*—The direct channel would shorten the distance from the bay to the Key Route Basin by about 3,000 feet and substitute one very slight angle and one angle of about 45° in the channel in place of two angles, each approximately 90° in the present channel. The difficulty of turning from the natural deep-water area east of Goat Island into the present channel and the danger of grounding, due to the narrowness of the present channel and to its alignment crosswise to the tidal currents, would be obviated. The wider and more direct channel would therefore result in some savings due to the shorter time of vessels in transit and in reducing the present danger of and delays due to groundings. The construction of port facilities as planned by the city and by private interests and the energy and enterprise which these interests display in securing business for the terminals in the basin will undoubtedly be reflected in an increase in the commerce in the basin. A wider and more direct approach channel will materially assist in this increase and, while the construction of such a channel at the present time, in view of the existence of the present channel, does not seem to be absolutely essential, it is believed that the stimulus of the improved channel would soon result in an amount of commerce justifying the expenditure. A channel 500 feet wide and 30 feet deep will,

it is believed, be sufficient to meet the needs of commerce for the present and immediate future. Ultimate enlargement to greater dimensions will very probably be necessary.

68. *Savings to be effected.*—The savings which an improved channel into the Key Route Basin would effect would consist of the saving in switching charges (as described in paragraph 42 above for the inner harbor) on the increased commerce which the improved channel and port facilities would attract to the outer harbor, and an economic saving to shipping through elimination by an improved channel of delays now encountered.

In 1925 the total commerce in the Key Route Basin was 240,644 tons, and the number of inbound and outbound vessels of greater than 22-foot draft was 50. The increase in the number of deep-draft vessels in the inner harbor in 1925 over 1924, due to increased port facilities, was sixfold. It is believed safe to assume that the construction of the proposed channel into the Key Route Basin would result in an increase of at least 100,000 tons of commerce per annum in the basin, which could be credited with a saving of 36 cents per ton over landing in San Francisco, and that at least 150 deep-draft vessels per annum would call at the terminals in the Key Route Basin within three years of the completion of the proposed channel. The savings that the proposed channel would effect in the cost of operating these vessels would be from three sources—savings in tow bills, time in transit, and decreased number of groundings.

Because of the difficulties of the present channel, practically all vessels have a tugboat assist them when going into or out of the Key Route Basin. This would not be necessary in at least half the cases were the channel wider and more direct.

The towing fee to the Key Route Basin is about $65. Assuming 150 deep-draft vessels per annum entered or left the basin and 75 of these vessels dispensed with a tugboat because of the better channel, the saving on this account would be about $4,875 per annum.

The proposed channel would result in a saving of at least 15 minutes in time of transit of each vessel, partly because of the shorter distance, partly because of the greater speed possible in the wider, more direct channel. Assuming a vessel costs $60 per hour to operate, 150 vessels would thus save $15 each or a total of $2,250 per annum from the saving in time.

Groundings in the present channel due to lack of width have averaged more than four per annum. The loss due to each grounding probably amounts to about $300 in lost time of vessel, and $500 for the services of powerful tugboats to pull the vessel off the flats. The total loss per annum on this account is thus approximately $3,200, which it is safe to assume would not occur with the proposed channel.

Summed up, the savings per annum which the proposed channel would effect, within three years after completion may be approximately estimated as follows:

100,000 tons of commerce, at 36 cents	$36,000
Savings in towing charges	4,875
Savings in vessels' time	2,250
Savings due to less grounding of vessels	3,200
Total, per annum	46,325

69. *Local cooperation.*—The eventual expansion of commerce and industry in the San Francisco Bay region, it seems safe to predict, will result in an extensive use being made of the "outer harbor" water front of Oakland and adjacent East Bay cities, particularly for terminal use by larger vessels. For the present, however, the water front of Oakland inner harbor, where the waterway has already been improved at large cost by the Federal Government, is not yet fully developed and there is ample room there remaining, so far as extent of water front is concerned, to care for all the necessary needs of commerce in Oakland Harbor for the present and near future. While, therefore, the growing commerce and increasing importance of the outer harbor, the terminal developments which are being undertaken there by the city and private interests, and the exercise of a reasonable provision for the future development of Oakland Harbor and the San Francisco Bay region as a whole, would apparently justify the United States in joining in and encouraging the initial steps being taken for the building up of a future harbor on the outer water front of Oakland, it is nevertheless felt that the present improvement of the channel to the outer harbor would be reflected in a local benefit to this portion of Oakland as much, at least, as in a benefit to the general commerce of the United States. It is my belief, therefore, that local interests should contribute one-half of the first cost of the improvement considered justified at this time. In addition, it is believed that local interests should be required to construct an adequate terminal, providing at least 500 linear feet of berthing space for deep-draft vessels in the Key Route Basin, with rail connection to at least two of the major railroads in the city, and to dredge and maintain a channel of equal depth as the approach channel and of adequate width between the above terminal and the inner end of the approach channel.

While the above discussion contemplates that the United States will bear one-half the first cost and all the cost of maintenance of a channel 500 feet wide and 30 feet deep to the pierhead line in front of the Key Route Basin, it is believed that, should local interests desire at their own expense to increase the depth to 33 feet, the United States would be justified in assuming the cost of maintaining the increased channel depth. As previously indicated, the future development of commerce and shipping in the outer harbor will probably, in the course of a few years, require greater depths than the 30-foot project which the immediate needs require at this time.

IX. Savings Resulting from Present and Proposed Improvements in Oakland Harbor, Taken as a Whole

70. An analysis of the transportation costs of the principal items which made up the commerce of Oakland Harbor in 1925 discloses substantial savings as a result of the past and present improvement of Oakland Harbor. In addition to the savings effected on 544,700 tons of miscellaneous imports and exports and coastwise receipts and shipments, specifically referred to in paragraph 42 above, other substantial savings for the harbor as a whole were effected. About 350,000 tons of the coastwise receipts of the harbor in 1925 consisted of lumber, which was either landed directly at retail yards on the water front or at a wharf from which it was hauled by consignee with

his own trucks at times when the trucks would otherwise be idle. The saving thus effected on this tonnage over landing at a wharf in San Francisco and shipping thence by rail to the various lumber yards in Oakland was 70 cents per ton. Of the internal receipts, 549,299 tons consisted of sand, gravel, and crushed rock, and 447,587 tons of fuel oil and gasoline. The cost of bringing sand, gravel, and crushed rock to Oakland in barges is about 31 cents per ton, while the freight rate by rail from the nearest source of supply of large quantities is 50 cents per ton, a saving of 19 cents per ton in favor of the water haul. The costs of transporting fuel oil and gasoline in bulk by water from the refineries on San Pablo and Suisun Bays to Oakland is about 24 cents per ton, while the freight by rail is 70 cents per ton.

Tabulating these various items gives the following savings:

544,700 tons of miscellaneous freight, at 36 cents per ton	$196,092
350,000 tons of lumber, at 70 cents per ton	245,000
447,587 tons of petroleum products, at 46 cents per ton	205,890
549,299 tons of building materials, at 19 cents per ton	104,367
Total	751,349

The cost of all new work in Oakland Harbor to date, including the estimated cost of completing the present project, is about $5,197,000. The improvements recommended in this report will increase this new-work figure by about $1,300,000, or to a total of about $6,497,000, with an estimated annual cost of maintenance of $100,000. Deducting the annual cost of maintenance of the enlarged project ($100,000) from the $751,349 savings in 1925 gives a net saving, based on 1925 commerce, of $651,349 annually. This is an annual return of about 10.02 per cent on $6,497,000, the estimated total cost of the enlarged project in the harbor, including all previous Federal improvements made in Oakland Harbor. As the business in the harbor grows, as it undoubtedly will, the return on the cost of constructing the channels will increase.

X. Unified Port Authority

71. Considerable study has been given in connection with the present examination and survey to the matter of the establishment of a unified port authority, representing both the cities of Oakland and Alameda, to be charged with the development and control of the publicly owned water frontage in Oakland Harbor and with the general supervision of the port, particularly so far as concerns Oakland Inner Harbor. Because of the geographical location of the inner harbor, lying generally between the cities of Oakland and Alameda, it is thought that the establishment of such a unified port authority is the logical solution of certain difficulties that have been encountered with reference to the inner harbor, in matters in which the interests of the two cities are sometimes in conflict. Joint port control, particularly of the inner harbor, should be of advantage in the matter of harbor-line changes, questions relating to the construction and operation of intercity traffic structures across the dividing waterway, such as bridges and tubes, a single harbor master to handle traffic, a single police control, a single fire patrol, better coordination in the matter of terminal and transfer facilities, and collection of commercial statistics.

72. In the work undertaken by the Federal Government of improving the inner harbor during the last several years and in the planning of future improvements, considerable difficulty has been encountered at times by reason of the dispute between the cities of Oakland and Alameda, heretofore referred to, as to the legal boundary line between the two municipalities in Brooklyn Basin. Press reports now indicate that the question has been settled in favor of Alameda, so that Government Island, in Brooklyn Basin, falls within the territorial limits of that city. The present and future major channel (and therefore the natural division between the two municipalities, from the standpoint of the use of the navigable waterways) lies south of Government Island rather than north thereof, and the final decision placing the municipal boundary north of Government Island is thus an important additional reason for instituting a joint port control in this locality.

73. On the other hand, as stated in Section III above, Oakland is proceeding vigorously in its plan for terminal construction in the inner and outer harbors, and private interests also are planning the building of additional facilities for accommodating commerce. The proposed construction when completed will provide facilities for a greatly increased commerce for the harbor. The construction planned by Oakland is being financed by a bond issue which has been authorized by the voters of the city. The establishment at this time of a unified port authority to control the publicly owned water front of both Oakland and Alameda would quite likely invalidate this recently authorized bond issue, thereby delaying the important municipal construction now provided for.

74. The legal processes required to establish a duly constituted joint port authority might require a period of several years or more. For this reason, and in order to avoid delaying the development of the port, as might and probably would result if the recent bond election in the city of Oakland were nullified through a change of port authority at this time, it is believed that the immediate establishment of a unified port authority should not be insisted upon by the Federal Government as a condition precedent to the adoption and prosecution of an enlarged project of channel improvement, particularly as the improvements of the navigable waterways recommended in this report fit in with the plans of either city for terminal development in Brooklyn Basin and elsewhere in the harbor.

75. However, the geographical conditions are such that the United States should at this time insist upon the ultimate establishment within a reasonable time of a joint port authority. Geographically, this authority should extend at least over the inner harbor, including the tidal canal and San Leandro Bay. To secure better coordination of effort and avoid possible friction, the territory embraced should also, it is thought, take in the outer harbors of Alameda and Oakland. Five years after the adoption of a new project should be sufficient time to make the necessary arrangements and put into execution a plan for a joint port authority to embrace the entire Oakland-Alameda water front, and it is the view of the district engineer that any new project adopted for Oakland Harbor should require that further maintenance by the Federal Government of any improvement in Oakland Harbor, after five years from the date of adoption of the project, shall be contingent upon the establishment and main-

tenance of a unified port control or authority as outlined above and having such organization, duties, and authorities as may be satisfactory to and approved by the Secretary of War and the Chief of Engineers. It is probable, with the continued development of the San Francisco Bay region, that further extension of the geographical boundaries of the Oakland-Alameda port authority will later prove to be desirable to include other municipalities on the east shore of San Francisco Bay.

XI. Local Cooperation

76. A considerable local benefit to Oakland and Alameda would undoubtedly result from the proposed channel improvements in Oakland Harbor. On the other hand, the port is attracting an increasing amount of through freight transferred at the Oakland Harbor terminals between ocean-going ships and rail or river boat. Benefits accruing to this commerce reflect a general rather than local benefit, and it is this class of commerce that the port of Oakland is bending every effort to attract.

77. Coordinated with the channel improvements which the Federal Government is requested to make, local interests, as previously pointed out, contemplate the expenditure of large sums in the construction of port terminals, including the dredging of slips alongside these terminals and of approach channels connecting the terminals with the through channels; in the provision of additional belt-line connections between terminals and industries and main-line railroads; and in the alteration or replacement of bridges over the channel in the inner harbor.

The program of the city of Oakland calls for the ultimate expenditure of $9,960,000 for terminal construction and allied improvements, and a bond issue of this amount for this purpose has been authorized. Private interests likewise contemplate the expenditure of upward of $1,000,000 in the near future in additional port facilities in the line of wharf, transit shed, and warehouse construction, and in the extension of the Alameda Belt Line Railroad.

In the matter of alteration of bridges, Alameda County is now engaged in the construction, at the instance of the United States and at an estimated cost of $4,496,000, of a vehicular subway to replace the Webster Street Bridge, the removal of which will be of very great benefit to commerce passing above Webster Street. The dredging of the tidal canal will require the replacement of the bridges over that waterway at considerably greater cost than the cost of deepening the canal.

In addition to the construction of port terminals and bridges, it is contemplated that reclamation in connection with dredging of the tidal canal will contribute, for the value of dredged material, an amount of approximately $53,330 toward the cost of dredging that channel.

78. In view of the increasing amount of benefit to general commerce to result from the proposed channels and of the large amounts to be expended by local interests in port improvements in connection with the through channels, it is believed that the Federal Government should bear the total expense of making and maintaining the improvements recommended, except that local interests should con-

tribute one-half the first cost of dredging the 30-foot approach channel to the Key Route Basin and the entire cost in excess of that depth, and an amount of approximately $53,330 (10 cents per cubic yard dredged) in return for dredge spoils to result from the deepening of the channel in the tidal canal. Local interests should also be required to furnish free of cost to the United States suitable dumping grounds for the disposal of dredged spoils; and for the reasons given in paragraph 37 above it is also thought—unless the sewers now emptying into the north channel of Brooklyn Basin are removed by the appropriate local authorities—that any new project adopted for Oakland Harbor should provide that future maintenance of such north channel by the United States be made contingent upon the contribution by local interests of 50 per cent of the cost of such maintenance. Definite assurances should also be required that local interests will construct at least one pier in the inner harbor, capable of accommodating two deep-draft ocean-going freighters, and one wharf in the Key Route Basin, or outer harbor, capable of accommodating one or more of such deep-draft ocean-going freighters, with berthing space in both cases of 500 or more linear feet per vessel and with spur-track connections to main-line railroads; and that such interests will dredge the berths alongside such pier and wharf, as well as necessary approach channels between the Government channels and berths, all to the project depths of the adjacent Government channels.

XII. Conclusions and Recommendations

79. The channels authorized by the present project for Oakland Inner Harbor are no longer adequate for the existing commerce in that portion of the harbor and for the type of vessels carrying a large amount of that commerce. Local interests have in the last year made extensive additions to the port facilities in the harbor, and, as a consequence, deep-draft vessels in increasing numbers are making this harbor a port of call. Public and private interests are planning the further expenditure, in the immediate future, of large sums of money in the construction of deep-water shipping terminals and allied facilities and in removing and replacing the bridges over the harbor.

80. In order to accommodate adequately the present and prospective commerce, it is believed that the channel depths across Goat Island shoal and in the inner harbor to harbor line point No. 58 in Brooklyn Basin should be increased to 33 feet at mean lower low water, and that the channel widths, upstream of Webster Street to the west end of Government Island, should be increased to 600 feet, with an additional widening, 33 feet deep, at the west end of Brooklyn Basin to provide a turning basin at that point. It is believed also that the area south of the channel between Harrison Street and Brooklyn Basin, in which the maintenance dredging is now authorized, should be extended eastward to harbor line point No. 58, this extension having recently been dredged 30 to 31 feet deep by private interests.

81. In the tidal canal lack of sufficient depth in the channel is a distinct handicap to vessels which now navigate this waterway. A depth of 25 feet in the canal is necessary to properly accommodate

the type of vessels now using this channel. Moreover, a 25-foot deep channel in the canal will permit and encourage the development, by dredging and reclamation, of the valuable industrial territory adjoining San Leandro Bay. Reclamation affected in conjunction with the dredging should bear a portion of the cost of deepening the channel in the tidal canal.

82. In the outer harbor the present municipal entrance channel into the Key Route Basin is narrow and indirect. Both the city of Oakland and private interests plan the construction of extensive additions to the port facilities in the basin and the present amount of commerce in this part of the harbor, although not great, is growing, and the completion of the contemplated port facilities will, in all probability, result in a marked increase in the commerce in this part of the harbor. The dredging of an improved channel, with the cooperation of local interests, appears warranted.

RECOMMENDATIONS

83. I therefore recommend, subject to the conditions hereinafter stated, that the existing project for Oakland Harbor be modified in the following items:

a. Deepening to 33 feet the existing channel, 800 feet wide across the shoal southeast of Goat Island, thence narrowing to 600 feet wide at the outer ends of the Oakland jetties; at an estimated cost of--- $118, 160
Estimated annual cost of maintenance--- 14, 300

b. Deepening to 33 feet the existing channel from the outer ends of the Oakland jetties to Harbor Line Point No. 58 in Brooklyn Basin (not including the local widening authorized by the existing project beyond the 600-foot wide through channel in front of the Oakland municipal quay wall); and widening to 600 feet said channel from Webster Street to the west end of Government Island, with an additional triangular widening at the west end of Brooklyn Basin, 2,700 feet long, 300 feet wide, and 33 feet deep, to provide a turning basin; at an estimated cost of--- 990, 560
Estimated annual cost of maintenance--- 53, 000

NOTE.—The above item contemplates the discontinuance of further maintenance by the Federal Government of the local widening in front of the municipal quay wall authorized by the existing project.

c. Maintaining to a depth of 30 feet and to within 75 feet of the pierhead line of the area lying south of the Government channel and situated between Harrison Street and Harbor Line Point No. 58 in Brooklyn Basin; provided that should local interests deepen to 33 feet the above-described area, or a suitable portion thereof, to provide, in connection with the Government channel, a local widening for the turning or maneuvering of vessels, the authorized maintenance by the United States to such greater depth of the area or portion thus dredged is recommended.

Estimated annual cost of maintenance--- $12, 000

d. Deepening to 25 feet for a width of 275 feet the channel in the tidal canal between Park Street and San Leandro Bay at an estimated cost of--- 285, 250
Amount of above to be contributed by local interests, 10 cents per cubic yard, estimated to amount to a total of--- 53, 330
Estimated annual cost of maintenance--- 1, 000

e. Dredging an entrance channel to the outer harbor (Key Route Basin) 500 feet wide and 30 feet deep, at an estimated cost of--- 239, 310
One-half of this cost to be contributed by local interests.
Estimated annual cost of maintenance--- 7, 000
Provided that should local interests, at their own expense, deepen to 33 feet the above channel to Key Route Basin, it is recommended that the United States maintain said channel to 33 feet.
Estimated annual cost of maintenance, 33 feet deep--- 7, 500

Summary

Total estimated first cost of enlarged project	$1,633,280
Amount to be contributed by local interests	172,985
Amount to be contributed by the United States	1,460,295
Portion of United States contribution chargeable to the existing project	241,620
Portion of United States contribution chargeable to new project	1,218,675
Total estimated annual cost of maintenance, including the maintenance of items of the existing project not enumerated by the above recommendations	106,000
Amount of annual maintenance cost to be contributed by local interests	5,350
Annual cost of maintenance to the United States	100,650
Increased annual cost of maintenance to the United States over the estimated cost of maintenance under the existing project	19,550

84. It is recommended, in addition to the requirements of local cooperation imposed by the existing project, that local interests shall provide suitable dump grounds for the disposal of dredged material for the enlarged project, together with all necessary levees, bulkheads, drainage canals, sluiceways, or other structures required therefor; that the adoption of the modified project be contingent upon the giving of assurances by local interests satisfactory to the Secretary of War that such local interests will alter or replace all or any of the bridges over the tidal canal, to the satisfaction of the Chief of Engineers and the Secretary of War, when, in the opinion of the Secretary of War, such alteration or replacement may be necessary to permit improvement of the channel or to render navigation in the tidal canal and through said bridges reasonably free, easy, and unobstructed, and upon the definite acceptance by Alameda County or other local body satisfactory to the Secretary of War of responsibility for the future maintenance, operation, and replacement of such bridges; that the increased dimensions over the present project dimensions in items *a* and *b* above be contingent upon the giving of assurances by the city of Oakland, satisfactory to the Secretary of War and the Chief of Engineers, that the city will construct and complete within one year from the date of completion of said enlarged channels, a pier in the inner harbor of sufficient size to accommodate two deep-draft ocean-going steamers at the same time, with berthing space of 500 or more linear feet per vessel, and with spur-track connection with the adjacent main-line railroad, and will dredge and maintain the berths alongside the pier and the connecting channel between the berths and the Government channel to a depth of 33 feet; that the deepening in the tidal canal be contingent upon the prior altering or removal, to the satisfaction of the Secretary of War and the Chief of Engineers, of the bridges over the tidal canal and upon the contribution by local interests of an amount of 10 cents per cubic yard of material dredged in such deepening, and in return have the privilege of using such material for reclamation of near-by land; that the dredging of the entrance channel into the Key Route Basin be contingent upon the payment by local interests of one-half of the cost of such channel and the guaranty by the city of Oakland that the city will, within

one year of the time of the completion of the channel, construct and complete a wharf in the Key Route Basin of sufficient size to accommodate at least one deep-draft ocean-going steamer, with 500 linear feet of berthing space and with spur-track connections with at least two of the main-line railroads in the city, and will dredge and maintain the berth alongside the wharf and the connecting channel between the berth and the Government channel to a depth of 30 feet; and that the continued maintenance by the United States of the north channel authorized by the existing project in Brooklyn Basin, except for any contract that may be in force and uncompleted upon the adoption of the new project, be contingent upon the removal by the proper local authorities of all sewers emptying into such north channel, or, in lieu of such removal, upon the contribution by local interests of one-half the cost of maintenance of such north channel.

85. It is further recommended that the proposed new project be known as the Oakland-Alameda Harbor and that all maintenance work by the United States under the existing or enlarged project, after five years from the date of the adoption of the new project, be contingent upon the establishment of a unified port authority to embrace the inner and outer water fronts of both Oakland and Alameda, and having such organization, powers, and duties as shall be satisfactory to and approved by the Secretary of War and Chief of Engineers.

86. The channels across Goat Island Shoal and to the outer end of the jetties and in the inner harbor to harbor line point No. 58, in Brooklyn Basin, should be dredged first. In order to secure a low unit price for dredging, the channel in the inner harbor, between the outer end of the jetties and harbor line point No. 58, should preferably be provided for under one contract. At the same time the channel across Goat Island Shoal and to the outer end of the jetties should be dredged by seagoing hopper dredge. The approach channel to the Key Route Basin should be dredged next, under a second allotment, and the channel in the tidal canal under a third allotment immediately after the completion of the alteration of the bridges over this waterway. The work should be completed in three years, and the annual allotments of United States funds should be as follows:

	First year	Second year	Third year	Fourth year
New work	$1,108,720	$119,655	$231,920	
Maintenance		14,300	[1] 77,400	$21,300
Total	1,108,720	122,570	309,320	21,300

[1] Mainly for items of existing project not altered by new project as recommended.

During the fifth or sixth year maintenance would be necessary of the new project channel in the inner harbor, and an allotment to cover the cost thereof would be requested.

JOHN W. N. SCHULZ,
Major, Corps of Engineers, District Engineer.

OFFICE DIVISION ENGINEER, PACIFIC DIVISION,
San Francisco, Calif., May 5, 1926.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The division engineer concurs in the conclusions and recommendations of the district engineer as expressed in Section XII of the foregoing report. The conclusions appear to be sound and the action recommended appears to be reasonable and appropriate for the next phase of the development of the port and to divide the cost equitably between the Federal Government and local interests.

2. The division engineer feels that he should emphasize the desirability of the establishment at an early date of a unified port authority, to embrace, in its earlier years, at least Oakland and Alameda. He bases this view on his conception of a future greater port now represented by separate ports of Oakland, Alameda, and Richmond. It appears to him almost certain that the lapse of years, probably not many years, will see the growth of these ports into a single physical port, which can be numbered among the most important of the country. That such an extensive port may be properly designed in advance of its growth and that the expenditure of vast sums for reconstruction and the loss of other sums in abandoned works may not be entailed requires a well defined comprehensive plan based on careful progressive study. Commendable as are the intentions of Oakland to create a Pacific port of the first importance, and well planned as its efforts seem to be, so far as they have progresssed, it is too much to expect that that city will, by itself, plan and build for the future growth beyond its borders. An organization of larger geographical jurisdiction is needed.

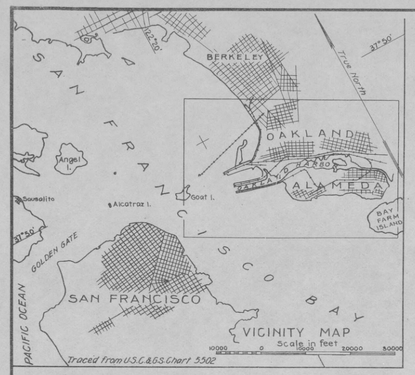
3. Under the peculiar conditions obtaining, it would probably be an undesirable restriction, as indicated by the district engineer (pars. 73 and 74), to require the complete establishment on a working basis of a joint port authority embracing Oakland and Alameda before a modified project for Oakland Harbor is adopted and work thereunder commenced. It does, however, appear desirable that certain positive action should be taken with respect to such requirement, viz, serve notice now that such condition will later become effective; call upon the city of Oakland and the city of Alameda to accept the principle of such future condition and to proffer their future support thereto; and finally make such acceptance and proffer of support by the city of Oakland a requirement precedent to the performance of any work under a modified project in either outer or inner harbor and by the city of Alameda with respect to work in inner harbor. That present action of the cities may not legally bind them in the future and that State legislation may be required in the organization of a joint authority are conceded; the object of the action proposed would be to announce the policy of the Federal Government and to demonstrate its reception by the cities involved. The project recommended is predicated on local cooperation. If that fails the project should be reconsidered.

G. R. LUKESH,
Lieutenant Colonel, Corps of Engineers,
Division Engineer.

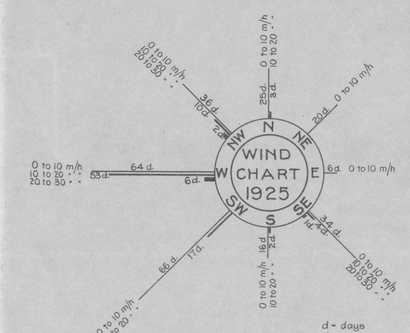
O

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY.



DIRECTION, VELOCITY, AND DURATION OF WIND



d - days
m/h - miles per hour

COMPILED FROM DATA OF U.S. WEATHER BUREAU, SAN FRANCISCO STATION

True North

LOCAL WIDENING UNDER EXISTING PROJECT, MAINTENANCE AT FEDERAL EXPENSE RECOMMENDED TO BE DISCONTINUED.

RECOMMENDED WIDENING 33 FEET DEEP

EXISTING PROJECT DIMENSIONS 25 FEET DEEP, 300 FEET WIDE.

EXISTING PROJECT TURNING BASIN 30 FEET DEEP

EXISTING PROJECT 18 FEET DEEP, 300 FEET WIDE

RECOMMENDED 25 FEET DEEP, 275 FEET WIDE, FROM PARK STREET TO SAN LEANDRO BAY.

EXISTING MUNICIPAL CHANNEL 30 FEET DEEP 250 FEET WIDE

RECOMMENDED 30 FEET DEEP, 300 FEET WIDE

RECOMMENDED 33 FEET DEEP, 800 FEET WIDE AT WEST END TO 600 FEET WIDE AT END OF JETTIES. EXISTING PROJECT, 30 FEET DEEP

RECOMMENDED 33 FEET DEEP, 800 FEET WIDE. EXISTING PROJECT 30 FEET DEEP.

RECOMMENDED 33 FEET DEEP, 600 FEET WIDE FROM END OF JETTIES TO WEST END OF GOVERNMENT ISLAND NARROWING TO 500 FEET WIDE OPPOSITE HARBOR LINE POINT NO. 58 EXISTING PROJECT, 30 FEET DEEP, 600 FEET WIDE TO WEBSTER ST., THENCE 500 FEET WIDE TO BROOKLYN BASIN.

ESTUARY SUBWAY UNDER CONSTRUCTION, EXISTING BRIDGE TO BE REMOVED.

RECOMMENDED TO BE MAINTAINED TO 30 FEET UNTIL LOCAL INTERESTS DEEPEN TO 33, THEN MAINTAINED TO 33 FEET.

EXISTING PROJECT, SOUTH CHANNEL 30 FEET DEED, 500 FEET WIDE.

TIDAL CANAL, EXISTING PROJECT 30 FEET DEEP 275 FEET WIDE TO PARK ST.

BEING DREDGED TO 30 FT.

Soundings are in feet and tenths and refer to the plane of mean lower low water.

The plane of mean lower low water is 2.75 feet below the U.S. Geological Survey Bench Mark Oakland, Broadway, front of Hall of Records, in foundation, on north side of entrance 4 feet above ground bronze tablet stamped '24'.

Positions are plotted by plane projection with true meridian through U.S.C.&G.S. Station Brooks Island, which is the origin of co-ordinates

Soundings are from U.S. Engineer Department surveys of Oct. 1925 to April 1926.

MAP TO ACCOMPANY SURVEY REPORT OF OAKLAND HARBOR DATED MAY 3, 1926.

OAKLAND HARBOR CALIFORNIA

Scale in feet
1000 0 1000 2000 3000 4000 5000 6000 7000

U.S. Engineer Office, 1st Dist., San Francisco, Calif., May 3, 1926.

Transmitted with report dated May 3, 1926.

Submitted: Henry L. Roots, Assistant Engineer

Approved: John W. N. Schultz, Major, Corps of Engineers, U.S.A.

Drawn by: R.McC.	Checked by:		
DOC. FILE	FILE	DIV.	SHEET
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House Doc. No. 407 | 69th Cong., 1st Sess.

Rogers Peters Co., Litho. Washington, D.C.